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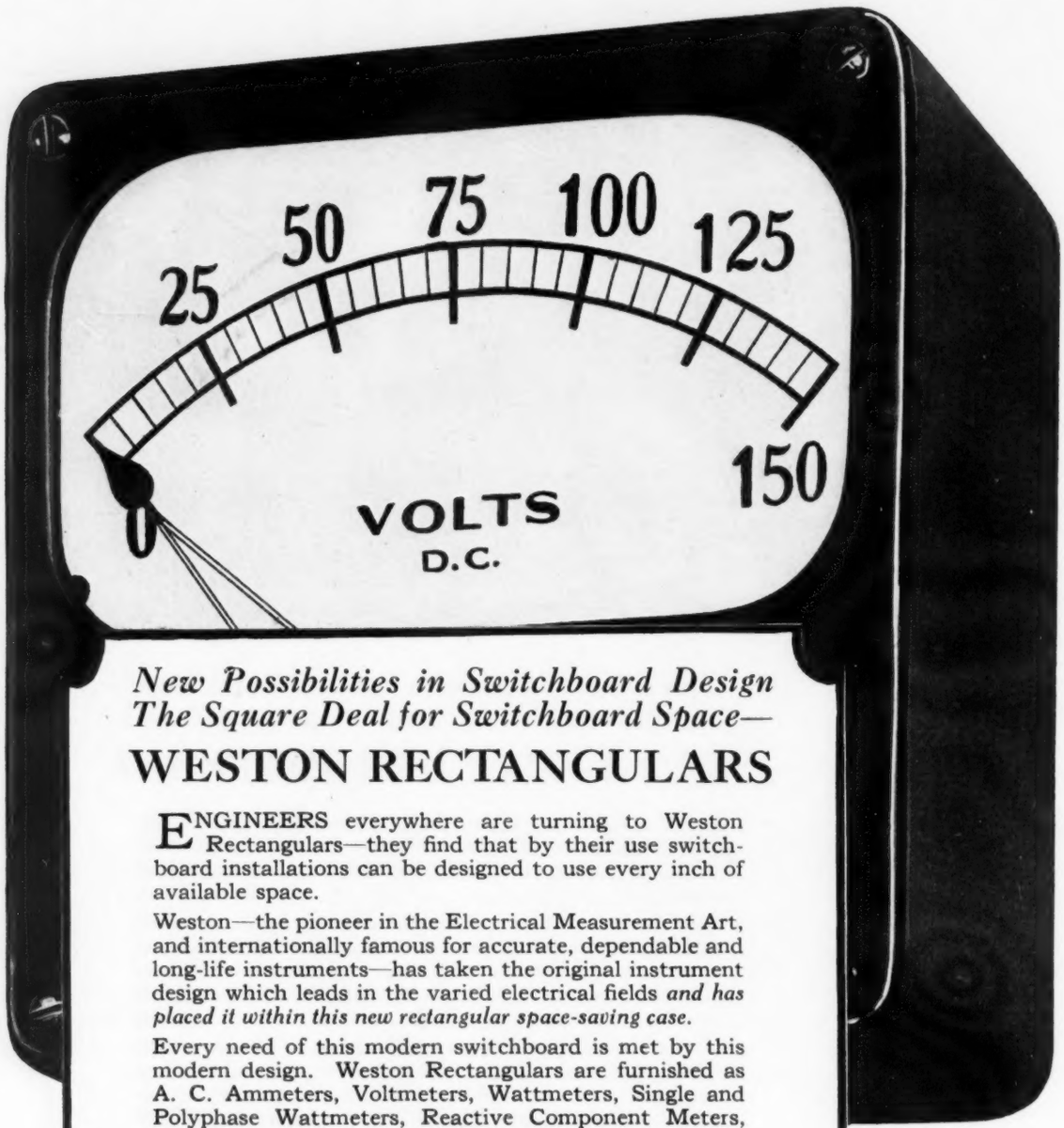

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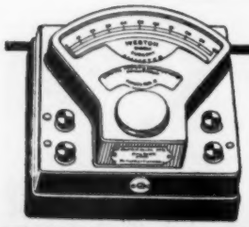

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Electrical World

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W. H. ONKEN, JR.
Editor

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A Success Built on Solid Foundations

WHEN not only the business men of a community but the whole city turns out to do honor to an electric light and power company, it indicates a high degree of appreciation. No public utility could ask more. It is the quintessence of good public relations. Such an honor was bestowed on the Columbia Gas & Electric Company in Cincinnati last week on the occation of the dedication of the new steam station of the Columbia Power Company on the Ohio River near its confluence with the Big Miami River.

While the station is big and represents the very latest practice in steam power-station design, the accomplishments of the utility company are bigger; and it was this rather than the mere starting of a superpower station that was at the bottom of the great demonstration in Cincinnati last week. Philip G. Gossler and W. W. Freeman have worked hard in the interest of better electric service for Cincinnati, and the record of expansion of the utility company is magnificent—a growth of more than 1,000 per cent in ten years, an expenditure of $43,000,000 and rates half what they were before the war. Any public utility man has a right to feel proud of such a showing, and small wonder that Cincinnati should take note of it. In helping to build up Cincinnati and the other cities and towns in the Ohio and Miami valleys the Columbia Gas & Electric Company has naturally built and strengthened itself. Diligence and public spirit combined with able direction have brought, as they should always bring in the electric light and power industry, a success accompanied not by public abuse and envy but by the generous applause of customers and citizens.

Electric Possibilities of the Old South

UPON those who have studied the Old South its potential wealth has always made a deep impression. Most people still think of it as the "Land of Cotton," but while that staple product has brought it fame and fortune, the South possesses hidden and undeveloped treasures of greater worth. The advertising genius of Henry Ford has placed Muscle Shoals on the map and in the minds of millions of people. It has also served to direct attention to the great industrial region centering around Birmingham and in the valley of the Tennessee River from above Chattanooga to its mouth.

Recent surveys made by the government reveal the immense power possibilities of the Tennessee and its tributaries in that district. These, coupled with the mineral and other resources of Tennessee and Alabama, indicate the great industrial possibilities of the Tennessee Valley. Indeed, some have referred to it as the American Ruhr. Certainly, it has enough coal and iron to rival the Ruhr Valley of Germany and greater hydro-electric power resources. What it lacks at present is more industries and more capital to develop its natural possessions. These will come in time, and although 4,000,000 hp. may not all be developed from the watercourses of Tennessee in the next decade, that state is certain to see a greater use made of her water powers in that short period than in all the years since her first settlement. Alabama has already shown a tremendous growth, although Georgia lags somewhat. The Carolinas under Duke have grown industrially by leaps and bounds, and Florida in the last year has shown a greater percentage of growth than them all. In another generation industry and not agriculture will dominate in the Old South. The plantations will remain, but instead of the restricted wealth which once flowed from them to a few families, electrically produced plenty will have the same wide distribution as in other parts of the nation.

At Odds Over the All-Metal Standard

THE Association of Electragists International has declared for the all-metal standard. The wiring committee of the National Electric Light Association has opposed the idea. This makes an unfortunate situation in the industry, for the interests of contractors and central-station men lie clearly in the same direction. Both want to see a greater number of homes and more commercial and industrial buildings wired more adequately and in complete safety. It is a pity that on a point so susceptible to proof there must be two national associations representing major branches of the industry in open disagreement.

There are two fundamental principles involved in this whole question of wiring, as both the contractor and the electric power man will readily agree. First, it must be safe; second, it must not be excessive in cost. The difference of opinion comes on the question as to what is costly and what is safe and on a very general misunderstanding of the actual intent of the all-metal standard. For a great many men believe that all-metal means rigid conduit construction exclusively, whereas the fact is that flexible armored cable, flexible metallic conduit and metal molding are also included, so that the only types of approved wiring construction which are barred out are the wood molding and knob-and-tube jobs. The contractors believe that there is a distinct advantage in an armored wiring system because of its ability to resist mechanical injury and prevent interference from plumbers, carpenters, steamfitters and other workmen during the construction period of the building and to discourage tampering by amateurs after it has been inspected and is in operation. They claim that an all-metal job today can usually be installed as inexpensively as knob and tube.

The contractor and the central-station man naturally approach the issue from different angles. The contractor primarily desires a good mechanical and electrical standard, which he knows must not be excessive

in cost if he is to sell in open competition. The central-station man desires more adequate installations, the largest possible number of outlets for the money, knowing that the entire market for electrical energy and for appliances is dependent upon the facilities for use provided in the wiring installation. But both of them and every other electrical man would welcome any new way to wire at less cost if it could be accomplished with full safety to life and property, because it would result in larger installations and greater use of electricity.

The N. E. L. A. wiring committee and the contractors cannot but be in harmony on these basic principles. It is to be hoped, therefore, that instead of standing at odds over the all-metal standard, they will unite in declaring clearly this inner purpose for which they are both working in the public interest. Incidentally this industry has set up an electrical code and a safety code and a well-defined procedure for meeting such issues. Little can be gained from a controversy based on a difference of opinion between two organizations. Much can be gained by following the course that has been established for judging the merits both of materials and methods.

Portable Lighting Equipment in the Home

ON SEVERAL occasions the ELECTRICAL WORLD has extolled the virtues of the portable lamp as a lighting device for certain purposes as well as an attractive earner of revenue for the central-station company. Renewed comment upon it is timely in connection with the article in this issue by M. Luckiesh. That the portable lamp is growing in popularity is shown by actual survey data, for it has increased in two years from an average of one and six-tenths per home to two and eight-tenths per home. Sales of "portables" by large department stores are in very large figures. Apparently in the past two years more than twelve million portable lamps have entered the homes of this country. At a very conservative estimate these have increased central-station revenue about a half million dollars a year. In other words, their sale is increasing the revenue of central-station companies by at least a quarter of a million dollars a year. One central station, indeed, has found that a 200-watt portable lamp has increased the net revenue from the homes which have installed it by nearly 300 per cent. Yet, according to the standard of lighting set up by Mr. Luckiesh, the present wired homes need about three time as many portable lamps as they now have.

The popularity of this lamp in the home is quite understandable and justifiable. It usually provides satisfactory lighting. When lighted it adds much charm to the room and when not in use it is a desirable bit of furnishing. It is portable and therefore can be placed where desired. It can go with the owner when he moves to another residence. For these reasons it is not surprising that it has been whole-heartedly accepted.

The more portable lamps a home has, the more flexible is its lighting system. Wiring becomes simplified in proportion to the number of convenience outlets in comparison with fixture outlets. It seems reasonable to expect a growing tendency toward equipping furniture possessing mirrors with shaded brackets. Then the lighting equipment is moved with the furniture. Hotels have found this to be a practicable plan. But there is need for convenience outlets for portable lamps and wired furniture. The central-station company should not only encourage the use of the lamps but should also bring pressure to bear in increasing the number of outlets. Every room should have at least one and the living room should have three or more. This means that the average home needs at least seven more convenience outlets if the use of the portable lamp is to be properly encouraged.

Make Use of System Performance Records

PERFORMANCE records of transmission lines have always been useful, when used, in determining whether a particular line of performance was satisfactory. The increasing voltage and length of transmission lines and the widespread interconnection of systems have made these studies of major importance. Operating engineers are now not only investigating the number and length of interruptions of a given line but are studying and classifying the causes of trouble. Efforts are being made to determine what percentage of interruptions and disturbances are due to trouble originating on the company's system or on the systems of interconnecting companies. Analyses are being made of interruptions due to windstorms, lightning storms, oil circuit breakers, insulators, conductors, structures, interconnections, repairs and other causes. One company by the critical analysis of summarized performance records reduced the number of interruptions within a year from thirty-five to six and the total time of interruptions from three hours and forty-one minutes to seven minutes.

The first requisite in this work is an adequate system of recording, summarizing and classifying the performance of every element in the transmission network. The preparation and maintenance of these records requires some expenditure of money and the continuous interest of the operating executive, but the operating company's experience mentioned above would seem more than to justify the expenditures required.

To Capitalize the Drift Toward Machinery in the Home

THE coal strike has undoubtedly advanced the adoption of oil burners for house heating by a great many years and rendered very valuable assistance to the electrical industry. Many of these oil burners will employ an electric motor, but that is not the point. The greatest benefit will come through the introduction of another piece of mechanical equipment in the home in a conspicuous service.

The electric clothes washer and ironing machine, the kitchen motor, the oil burner and the electric refrigerator are combining to establish a new idea in the American home—the idea of plant equipment. They are bringing a new psychology into the household. For the old idea in housekeeping has been that servants or members of the family did the work with the help of a few tools, just as men used to do the work in factories. But, just as times have changed in productive industry, machines having assumed the burden of labor with men to tend them, the same change is now coming into that greatest of all industries, the home. Inventive genius

has turned its eyes toward the kitchen, and the next decade is going to see a great evolution in both the processes and the economies of housework through the application of power and heat as substitutes for human labor.

The central-station executive may regard this in either of two ways. He may sit back and congratulate himself that electricity will inevitably play a great part in this movement and take the benefits as they come, or he may make himself an instrument of evolution and become the leader in the interpretation of this new philosophy to the men and women of his community. No greater single service can be rendered to the people of America today, valued in terms of human health and happiness.

Is Group Driving on Its Last Legs?

NO MAN knows how many gallons of ink have been shed on behalf of the individual motor drive during the present century. It seems to have become an accepted idea among laymen that modern motor applications are almost synonymous with independent powering for each machine, and even among engineers the opinion is widely held that group driving is a relic of electrical antiquity. Single motors for individual driving far outnumber those for group service in the resale figures of one of the largest manufacturers; whole industries are co-operating with motor makers for the co-ordination of designs on the independent drive basis, and yet group driving continues to be installed, maintained and now and then put in place of individual motoring. Clearly enough, this time-honored debate has never been settled once and for all, and the advent of the power-factor-correction problem and the pursuit of higher efficiency in the investment of capital and in the operation of industrial plants and mercantile establishments have given such discussion a new lease of life.

In certain industries the individual drive appears to have won an almost impregnable place. In the steel-making field group driving shows small likelihood of ever attaining any real vogue, and in the heavier machine-tool industry the trend is definitely toward one or more motors per tool and away from two or more tools per motor. The remarkable advantages of sectionalized motor driving in the paper industry have come to stay. Individual motor drive is hitting a faster stride toward popularity in the marble-working industry, and in the printing trade and numerous other fields one cannot see any general movement toward group applications. But in the textile, woodworking and machine-shop fields the issue is at present quite sharply joined between the two types, and, perhaps most significant of all, some of the best-informed central-station power engineers are declaring themselves opposed to the wholesale use of individual motors.

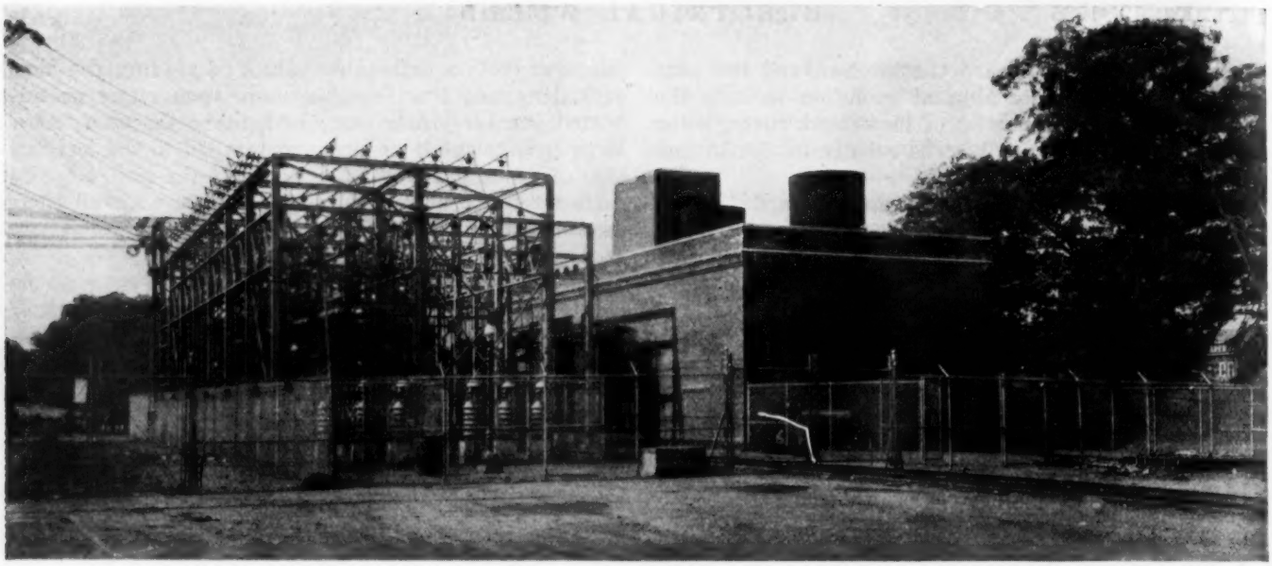
Personal interviews with a goodly number of engineers and industrial men during the past few weeks reveal striking differences of opinion as to the fields of these two salient types of drives and also disclose in some territory at least a scarcity of comprehensive analyses of specific motoring problems capable of general interpretation. Some engineers prefer individual driving regardless of comparative total costs; others consider the group drive best for their conditions, apparently being influenced by initial costs and power-factor-correction arguments that to their minds overbalance the well-known benefits of individualization. In one case certain intangible values of ridding the shop of belting and line shafting more than offset an admitted greater yearly cost; in another the study of a large investment in separate motors led to the installation of group driving and the sale of the smaller units even after a considerable period of use with all their advantages in flexibility. Both these concerns are staffed by high-grade technical talent.

Out of these and many other surveys comes the conclusion that, despite more than a quarter-century of successful individual driving, there is still need of investigating both types of application with more thoroughness before reaching decisions whether to install one or the other new, to extend or to alter existing plants with either or both. After the balance sheet is prepared, due weight can well be given to features of the local problem difficult to evaluate in money, and these will often turn the scale toward the individual drive with its powerful appeal on the score of convenience, safety, compactness, economy in many cases in power consumption, cleanliness and stimulus to production. But to conclude sweepingly that the group drive is on its last legs—or shall we say belts?—is to make a most unjustified assertion, and it is true today as it was years ago that the selection of motors for specific applications is first of all an engineering problem, neither now nor in the near future to be solved most successfully without painstaking study of the details of each situation presented for technical and executive decision.

Fixing Weak Links as They Occur

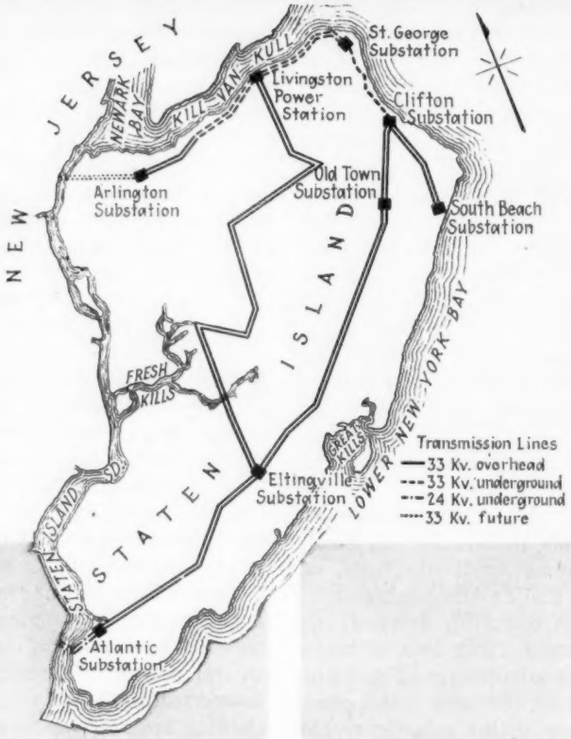
MOST light and power companies are subject to growing pains. Local ailments continually develop as the properties become larger and larger, and these ailments must be remedied promptly and correctly. A severe epidemic may break out among the machines used in power stations, because demands for larger-size units have caused developments beyond the limits of existing experience in design. When this epidemic is cured, diseases may appear in the transmission-line towers or insulators as voltages increase and conductors grow larger. Again ailments may occur in underground cables, oil breakers, relays or other apparatus. Consequently the engineer-doctors are kept very busy rushing from place to place with their remedies.

Sometimes the remedies cure the ills in one part of the system only to cause new weaknesses to appear at other spots. If the transmission engineers insulate the lines heavily, then high voltages cause breakdowns at terminal apparatus, and very often the effect of increasing factors of safety at one point is to cause troubles to appear at other points. These conditions indicate that it is becoming increasingly necessary to hold engineering clinics where the whole body may be carefully examined before operations are performed or specifics applied. As systems grow larger and larger there is a tendency to decentralize the activities of engineers even to the extent of subdividing their activities into distinct and apparently unrelated fields. Care must be exercised to co-ordinate thinking and to strive, even in N. E. L. A. committees, to prevent a particular group doing work which may cure the ailment of the patient in one spot and yet transfer the disease in aggravated form to another location. It is very necessary to have a system diagnosis if permanent improvement in the patient is to be brought about.



Electrification of Staten Island Lines of Baltimore & Ohio Railroad

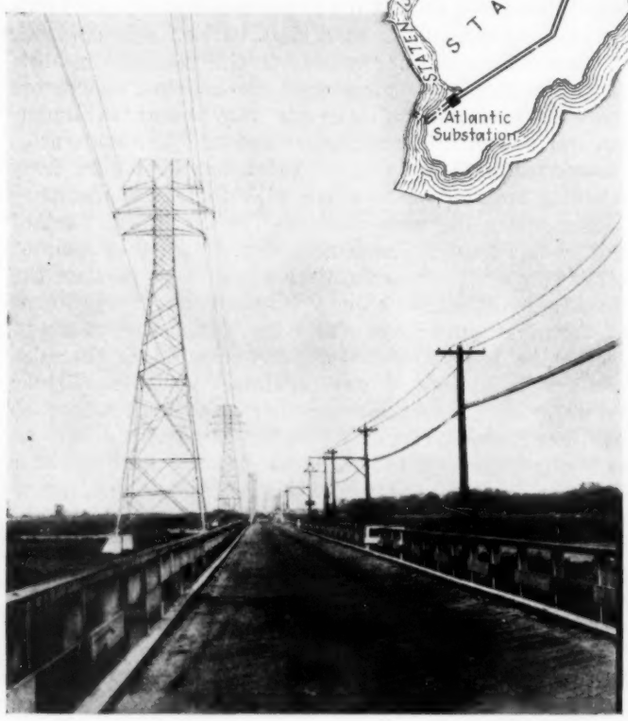
THE Baltimore & Ohio Railroad has recently completed the electrification of two subdivisions of its Staten Island lines, and the third and remaining subdivision will be electrified by the end of 1925. Multiple-unit cars, taking power at 600 volts, direct current, from a third rail, compose the rolling equipment. Three-phase, 60-cycle, 33,000-volt energy is furnished by the Staten Island Edison Corporation to six substations owned and operated by the railroad company, and with a total capacity of 12,000 kw. in 1,000-kw. synchronous converter units. All of the substations except the one at St. George, which is attended, are equipped with full automatic control on which is imposed a supervisory system centering at St. George, and through which the stations are subject to human control when such is desirable.



At the top is a view of the Eltingville substation, showing outdoor high-tension switching installation and transformers.

In the map is shown the 33-kv. "ring" transmission system to railway substations, comprising more than 50 miles of double-circuit line, of which nearly 10 miles is underground.

Below, at the left, is shown special long-span line construction over swampy ground, while at the right is shown standard wood-pole construction on railroad right-of-way.



How Pole Consumer Can Benefit Himself

Economical Utilization Essential to Perpetuate Adequate Supply of Suitable Pole Timber—Involves Treatment, Modified Specifications, Anticipation of Wants and Uniform Inspection

By H. S. SACKETT
Consulting Timber Engineer, Chicago

FIG. 1—TYPICAL STAND OF SOUTHERN YELLOW PINE POLE TIMBER

DEPLETION of the pole-timber supply has already cost the electrical industry millions of dollars, largely in increased costs. The penalty is mostly self-inflicted, the one exception being the inexorable exhaustion of chestnut caused by the disastrous "blight." Without the cheap, readily available wooden pole the ever-growing network of transmission lines spreading over the country could not have been built in the time they have been. The capital for suitable substitutes, even if available, would not have been obtainable. The relative cheapness of the wooden pole can be maintained, and a suitable supply of timber actually perpetuated, by the application of common sense well mixed with accurate knowledge concerning the mechanical and physical properties of the available species, the finished product, and by true economy in utilization.

Fortunately, elimination of preventable waste by timber-consuming industries is being given more practical consideration, as is evidenced by the effective co-operation between government agencies and the business interests directly involved.

However, it is essentially true that what money demands it will obtain. Reforms to be effective must originate with the purchaser, who may profitably absolve his duty to conserve timber by adhering to existing standards and aiding in their further development and application.

In less than half a century the source of supply of pole timber has steadily receded from the chief consuming centers. At present the last stands have receded to the extreme West and the extreme South. Transportation charges alone have taken many millions of dollars out of the pockets of the consumers of poles. Chestnut pole timber has reached the vanishing point. What remains is restricted in its distribution by its great weight and is further handicapped by lack of

efficiency in production and impracticability of proper preservative treatment. The former abundance of Northern white cedar is no more, and although still available in limited lengths, cannot be considered an adequate source for conductor supports required by modern conditions. There remain, therefore, two species of the commercially available woods suitable for pole line construction—namely, Western red cedar and Southern yellow pine, upon which devolves the burden of a perpetual supply of economical poles.

An assured and adequate supply of the raw material is not, however, the complete solution of the problem of providing for the future sufficient economical wood poles that will satisfactorily meet requirements.

The tremendous waste caused by decay, necessitating replacement of millions of poles in a few years, is entirely avoidable and must cease or all efforts toward conservation applied to production must come to naught. No untreated wood pole should ever be used, irrespective of species, even under conditions where the period of usefulness is assumed to be less than the natural life of the timber. Poles should be chemically treated to achieve the maximum of life, and when this exceeds the predetermined span of years of one location, the poles should be salvaged and placed in further service. Had such economy been practised a score of years past, many thousands, very likely millions, of dollars would have been saved and present consumption reduced by a third. It is stated in a brochure entitled "Wood Waste Prevention," published by the U. S. Department of Agriculture, that 50 per cent of the annual cut of timber used for poles is required to replace the loss due to decay. The annual consumption now approaches 5,000,000 poles; therefore, in the light of the foregoing statement, there exists a preventable waste, approximately, in excess of fifty million cubic feet of timber each year.

Another item of direct waste is represented by purely theoretical requirements, frequently expressed in so-called standard specifications that have been drawn without regard to the natural characteristics of the timber, which require grades or measurements obtainable only by "manufacturing," and the selection of but a portion of the total volume cut for the purpose, causing a tremendous extravagance in raw material, which, though paid for by the consumer, remains an irreplaceable loss. Careful consideration should be given to whether the greater value of the product obtained by such requirements warrants the waste of the timber destroyed to obtain it.

TABLE I—APPROXIMATE GROUND LINE MEASUREMENTS OF SOUTHERN YELLOW PINE POLES (6 FT. FROM BUTT)

In accordance with various bases for taper and actual measurements

Col. 1	2		3		4		5		6		7	
Size	Taper ½ In. in 10 Ft.		Tap. 1 In. in 10 Ft.		Actual Average		Average Top ½-In. Plus Tap. 1 In. in 10 Ft.		Tap. 1 In. in 12 Ft.		N.E.L.A.	
	Cir.	Dia.	Cir.	Dia.	Cir.	Dia.	Cir.	Dia.	Cir.	Dia.	Cir.	Dia.
In. Ft.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
7 20	25.1	8.0	26.4	8.4	26.7	8.5	28.3	9.0	25.4	8.1	....	....
25	26.7	8.5	28.0	8.9	28.3	9.0	29.8	9.5	27.0	8.6	28.5	9.1
30	27.6	8.8	29.5	9.4	29.8	9.5	31.4	10.0	28.3	9.0	30.5	9.7
35	28.5	9.1	31.0	9.9	31.4	10.0	33.0	10.5	29.5	9.4	32.0	10.2
40	29.8	9.5	32.7	10.4	33.7	10.7	34.6	11.0	31.0	9.9	34.0	10.8
45	31.4	10.0	34.2	10.9	34.6	11.0	36.0	11.5	32.4	10.3	36.0	11.5
50	32.4	10.3	35.8	11.4	37.7	12.0	36.7	11.75	33.7	10.7	38.0	12.1
55	33.7	10.7	37.4	11.9	38.3	12.2	37.7	12.0	35.0	11.1	40.0	12.7
60	34.6	11.0	39.0	12.4	40.2	12.8	40.5	12.9	36.0	11.5	42.0	13.3
65	35.8	11.4	40.5	12.9	40.5	12.9	42.1	13.4	37.4	11.9	44.0	14.0
8 20	29.0	9.2	29.5	9.4	30.8	9.8	31.4	10.0	28.5	9.1	....	....
25	29.5	9.4	31.0	9.9	31.4	10.0	33.0	10.5	30.2	9.6	30.0	9.55
30	30.8	9.8	32.7	10.4	32.7	10.4	34.6	11.0	31.4	10.0	32.0	10.2
35	32.0	10.2	34.2	10.9	34.2	10.9	36.0	11.5	32.7	10.4	34.0	10.8
40	33.0	10.5	35.8	11.4	36.7	11.7	37.7	12.0	34.2	10.9	36.0	11.5
45	34.6	11.0	37.4	11.9	37.7	12.0	39.3	12.5	35.7	11.3	38.0	12.1
50	35.7	11.3	39.0	12.4	41.0	13.0	40.0	12.25	36.7	11.7	40.0	12.7
55	36.7	11.7	40.5	12.9	41.5	13.2	41.0	13.0	38.0	12.1	42.5	13.5
60	37.7	12.0	42.1	13.4	43.4	13.8	42.5	13.5	39.3	12.5	44.5	14.2
65	39.0	12.4	43.7	13.9	43.7	13.9	44.0	14.0	40.5	12.9	47.0	14.9

True economy and practical timber conservation are correlative factors. The tangible advantages of the first pay handsomely for the patriotic necessity of practising the second. Here are, in summation, the profitable reforms that must be initiated by the purchaser of poles:

(a) Diminish demand for unreasonably oversized poles; (b) employ only poles that have been given a proper preservative treatment, that have been thoroughly impregnated, that will assure a minimum of twenty-five years life; (c) adjust or modify specifications, to allow the use of the maximum percentage of the timber cut for pole production; (d) reduce stocks required to be carried by producers through simplification of specifications and eliminating unnecessary classifications of sizes and grades; (e) aid economical production and distribution by buying three to six months in advance of needs; (f) co-operate with producers to devise a centralized system of inspection, satisfactory and just to both, which will reduce the cost of this necessary function and tend to advance uniform quality.

It may seem that all the burden has been placed upon the consumer. Obviously the producer is of necessity an opportunist. He frequently overreaches himself in endeavoring to please the purchaser, as long as that course is profitable. Irrespective of the waste involved, either monetary or of material, he bids on specifications, as is, and *caveat emptor*. Service is only too often erroneously applied to extravagances in selling and distribution that make up a goodly portion of the unnecessarily wide difference between producing and selling costs. Such special service is plainly a luxury that, perhaps, caters to the vanity of the purchaser but for which he pays quite well. Every needless obstacle, every useless restriction and non-essential requirement merely pyramid costs. Their elimination is the customer's task.

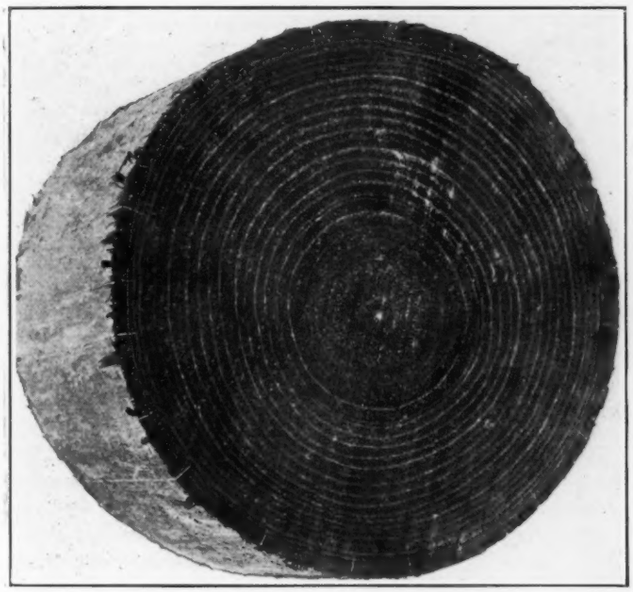
SOUTHERN YELLOW PINE POLES ABUNDANT AND ECONOMICAL

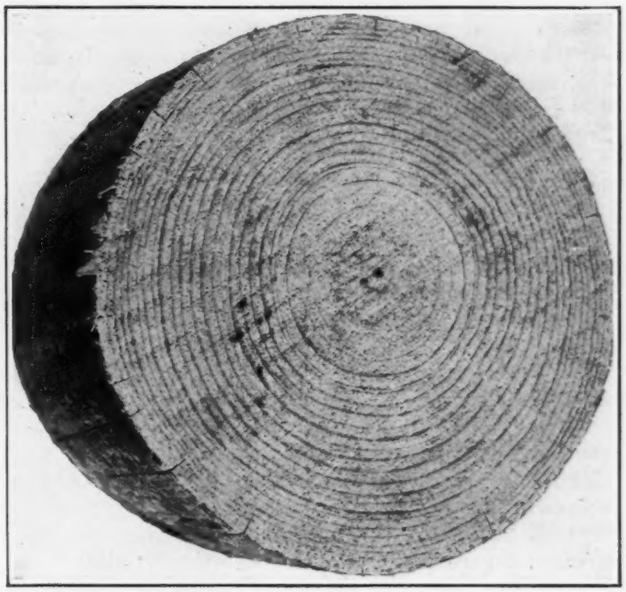
That Southern yellow pine must and will become a factor of increasing importance in the supply of poles seems a permissible conclusion. Therefore it is logical to expect that with the widening of the field in which it may be advantageously employed, Southern yellow pine will be subjected to specifications controlling both production and utilization. Obviously it has distinctive characteristics both in the raw state and in the finished product.

Compared with chestnut and the cedars, heretofore comprising roughly three-fourths of the poles consumed, Southern yellow pine is not durable unless protected against decay by chemical treatment applied to the entire pole. Service records in restricted sections here, and more generally abroad, have, however, demonstrated their long life when properly treated, also the very decided economy derived by their employment. Thousands of pine poles, creosoted their full length by the Rueping empty-cell process, have served more than twenty-five years in the English telephone and telegraph service. In this country conditions differ, as do

those controlling distribution and transmission lines compared with telegraph lines, and these differences require considerable amendment of European practise.

Economy and conservation lie in utilizing the maximum percentage of the available grade and character of the timber suitable for poles. With this fact in mind, Table I is presented for the purpose of illustrating the necessity of confining specifications covering ground line measurements within reasonable limitations. The only general specifications containing ground line measurements for Southern yellow pine poles (column 7, Table I) establish minimum requirements exceeding the average of the general production (column 4, Table I) and by demanding an unnatural result automatically increase the cost of the supply and the percentage of waste. The measurements shown in column 2 of Table I





FIGS. 2 AND 3—CROSS-SECTIONS OF TREATED AND UNTREATED SOUTHERN PINE POLE
At left, average grade available; at right, dense yellow pine showing complete impregnation of sap-wood obtained by Rueping empty-cell process (8 lb. per cubic foot final retention).

more nearly approach a minimum to which the greater volume of timber could readily conform, although if established would undoubtedly injure Southern yellow pine as compared with some of its competitors. The correct requirements probably lie between these extremes, as indicated by the relative strength of Southern yellow pine poles given in Table II.

It is evident that the strength values based on the minimum taper are obviously too low, where the maximums are probably too high. The solution can be found in a workable medium that can readily be developed through co-operation between producers and consumers. That the present method of selling on top measurements alone is unsatisfactory to consumers because of the uncontrolled variableness of taper must be recognized by producers, otherwise the benefits of augumenting the supply of poles by the addition of creosoted yellow pine will largely be lost.

Properly Creosoted Pine Poles Are Clean

Thus far only the creosoted pine pole has been given consideration, as other treatments have not generally been used in the United States, or only to such a limited extent as to be of secondary importance. Creosoting Southern yellow pine poles their full length has caused much unfavorable comment, also directly unsatisfactory experiences, because of alleged or actual exudation. Especially is this matter of weight in densely populated and urban communities; nevertheless, clean creosoted Southern yellow pine poles can be and are produced. Here again much of the responsibility lies with the consumer. Definite knowledge of the proper process to assure clean, so-called "non-bleeding" poles is readily available.

For the most valuable experience on impregnation one must turn to the British Isles and continental Europe. From there the empty-cell, with initial air, process of creosoting was brought into this country, because it allowed of thorough impregnation of the wood with the greatest possible economy and provided creosoted timber that could be guaranteed clean and consequently not objectionable in that respect.

The essential requirements may be enumerated as follows: (1) Treatment of only thoroughly air-seasoned timber; (2) employment only of a high grade of pure creosote oil, not less than Grade I, American Wood Preservers' Association specifications; (3) an initial air pressure varying between 60 lb. and 90 lb. per square inch; (4) injection of creosote oil under a pressure of from 150 lb. to 175 lb. per square inch, and (5) a subsequent quick vacuum of about 24 in.

The essential points of the British and American standard specifications for Rueping-treated pine poles as contained in the British Post Telephone and Telegraph specifications adopted 1921 [from *Proceedings* of the American Wood Preservers' Association] and in the "Specifications for the Preservative Treatment of Poles by Pressure Processes," adopted by the American Wood Preservers' Association in 1924, should also be considered.

Exudation of any oily substance from poles treated by the Rueping empty-cell process is entirely unnecessary and can be avoided where proper care is exercised in the preparation of the timber for treatment and the process of treatment is correctly conducted. The so-called "sweating" or "bleeding" of creosoted pine poles is confined to such as are treated by the Bethel, full-cell process, or abortive empty-cell processes, and poles

which have been seasoned improperly or steam seasoned. In controversion of this statement the fact may be cited that the largest consumer thus far of creosoted pine poles in the United States has standardized on the full-cell treatment, requiring a minimum injection of 12 lb. of creosote oil per cubic foot. Such poles, however, are largely used on private right-of-way, where the only objection to exudation may be voiced by linemen. The assumption that such treatment alone offers the necessary safety factor in protection against decay is erroneous in the light of the long experience of the British Post Telephone and Telegraph, which far exceeds that of their American colleagues. The empty-cell process with initial air (commonly known as the Rueping process), by virtue of the greater initial injection of about 16 lb. of creosote oil per cubic foot and the high pressures and effective vacuum involved, affords a far more thorough diffusion of the creosote oil throughout the wood structure, consequently assuring complete impregnation of all sap-wood, especially when the percentage of sap-wood is considerable, than is possible with the injection of but 12 lb.

NEW GERMAN TIMBER-TREATING PROCESS PROMISING

Reference to preservative treatment of pine poles would not be complete if mention of a process new to this country but in use in Germany for upward of ten years were omitted. The preservative is known as Wolman salts, consisting chiefly of sodium fluoride and dinitrophenols, described as equal to creosote in toxicity; likewise it is said to be permanent, and although a water-borne solution, the mordants present accomplish positive fixation in the wood fibers, precluding depreciation of the preservative protection by leaching. It is claimed for this preservative that poles impregnated therewith are not alone protected against decay equally as well as with creosote but are fire resistant to a greater degree, retain the initial strength of the wood and permit painting of the impregnated poles any desired color; it is also claimed that the cost of treatment is lower.

The only service records available are from Germany, covering a period of somewhat more than ten years. These are quite promising and would recommend serious consideration of the preservative and process by American consumers. Unquestionably, further developments may be looked for from the introduction of Wolman salts in the United States, which it is well worth while to study with care.

As previously suggested, unnecessarily rigid requirements inevitably increase costs. So far only one attempt has been made to provide specifications for Southern yellow pine poles: the adoption by the National Electric Light Association, about 1914, of the A. T. & T. specifications. Unfortunately, the requirements for ground line measurements therein have entirely disregarded the natural taper of the available timber. They are met only by careful selection, and the "manufacturing" of poles, which restricts materially the supply by eliminating a large percentage of perfectly suitable timber, and causes considerable waste where longer poles must be "cut back." Consideration of this phase leads to the following conclusions:

(a) The minimum ground line measurements should not exceed a taper of 1 in. in each 10 ft. of length, based on the minimum top diameter or circumference; (b) the grade of timber required can safely be specified as "Southern yellow pine," or if "dense" timber is to be required, then the A.S.T.M. density rule should be modified to five annual rings per inch, instead of six annual rings.

Justification of the proposed modification of the density rule lies in the essential difference in the mechanical properties of select grades of sawed timber and of the entire product, or tree, which the pole is. In Bulletin 556 (U. S. Department of Agriculture) are given the following values for modulus of rupture of select, clear, green pieces of wood: Pine, long-leaf, 8,700 lb. per square inch; pine, short-leaf, 8,000 lb. per

TABLE II—RELATIVE STRENGTH OF SOUTHERN YELLOW PINE POLES

Expressed in breaking point, in pounds per square inch, as indicated by values for modulus of rupture recommended by report of U. S. Forest Service (Forest Products Laboratory, Wilson, 4/6/23)

Comparison based on averages of representative lengths of each group of 7-in., 8-in. and 9-in. tops, developed from ground line measurements, Table I.

Description	Breaking Point, Lb. per Sq.In. 9-In. Tops	8-In. Tops	7-In. Tops	Modulus of Rupture
(1) Southern Yellow Pine—Sound				
(a) Taper, ½ in. in 10 ft.; min. tops..	2,361	1,981	1,463	6,300
(b) Taper, 1-in. in 10 ft.; min. tops...	3,040	2,508	1,881	6,300
(c) Actual average ground line measurements	3,208	2,695	2,062	6,300
(d) N.E.L.A. (A.T. & T.) specifications, irrespective of tops	3,434	2,511	2,033	6,300
(e) Taper 1 in. in 10 ft.; average tops, ½ in. excess of minimum	3,462	2,806	2,190	6,300
(2) Southern Yellow Pine—Dense				
(a) Taper ½ in. in 10 ft.; min. tops...	2,737	2,295	1,695	7,300
(b) Taper 1 in. in 10 ft.; min. tops...	3,522	2,906	2,178	7,300
(c) Actual average ground line measurements	3,717	3,122	2,371	7,300
(d) Taper 1 in. in 10 ft.; average tops, ½ in. in excess of minimum	4,020	3,255	2,537	7,300

square inch, which, however, are not applicable to poles. In a subsequent report of the Forest Products Laboratory (U. S. Department of Agriculture Forest Service), issued in 1923, bearing the identification No. 763, L-1, "Results of Some Strength Tests on Wooden Poles," the following values for modulus of rupture are recommended for green poles: Southern yellow pine sound, 6,300 lb. per square inch; Southern yellow pine, dense, 7,300 lb. per square inch. Undoubtedly the differentiation between pole timber and select, clear pieces of the same wood is entirely correct; hence the latter values are not alone safest but probably authoritative. By the same reasoning timber that has five rings per inch or more and a minimum of 33⅓ per cent summer wood is readily equivalent for employment as poles to the dense grade aforementioned, providing it otherwise meets the density rule requirements.

Specifications requiring a high degree of safety are essential, but should not result in developing conditions apt to defeat their usefulness by special classifications contrary to the characteristics of the raw material dealt with. It behooves the producers to recognize the needs of the prospective consumers and present their finished product accordingly. In many instances, cost, probable strength, etc., are secondary to physical appearance and condition. Poles that are crooked, that exude oil or other disagreeable substance, that are otherwise unsightly to the public eye cannot hold a market, though they may have temporarily captured it. As such circumstances are unnecessary, they must be avoided. The producer who carelessly permits developments of that nature harms the industry far more than himself. The consumer need not fear such unpleasant consequences if he avails himself of two means of protection he has always at his command: First, proper specifications; second, rigid inspection from stump to line.

Residential Rates That Encourage Use

Balanced Revenue Essential to Central-Station Prosperity — Stabilizing Effect of Residence Service—Impressive Results of Experience with "Come-Along" Feature of Three-Part Rate

An Interview with
C. L. CAMPBELL
Secretary and Treasurer Connecticut Light & Power Company, Waterbury, Conn.

COMPOUND rates for residential service deserve the backing of the entire central-station industry, in the opinion of C. L. Campbell, secretary and treasurer of the Connecticut Light & Power Company. To a representative of the ELECTRICAL WORLD who recently visited Waterbury to discuss the relation between load building and rates Mr. Campbell declared that there is at present a tendency for the electric service business to get out of balance; that in emphasizing the value of industrial loads many executives are overlooking the stabilizing worth of residential service, and that rates that stimulate instead of discourage the extensive use of electricity in homes of all types are profoundly important in relation to central-station prosperity.

C. L. CAMPBELL

"Without in the least belittling industrial loads," said Mr. Campbell, "it is essential for executives to realize the unbalancing effect and potential instability of these in periods of business depression. Many companies now have too large a proportion of their business represented in industrial activities and are paying less attention to that class of business which used to be recognized as unaffected to any material extent by hard times. It is time to make vigorous efforts to restore, as far as possible, the proper balance by developing the residential and the retail lighting business."

Asked whether many executives have not lately failed to appreciate the economic value of pushing residential service from the standpoints of both customer and company, Mr. Campbell replied that the volume of the industrial business has often overshadowed home service. "There is one very marked benefit of residential electric service," said he, "which is frequently lost sight of in the attempts of almost innumerable commodity manufacturers and salespeople to market their products from door to door. This is the reduction of the stress and strain of life, proportional to the degree the home is electrified. The electric washer and the cleaner, to say nothing of many other socket devices, lighten the burdens of living in ways that are out of the question with many non-electrical products sold intensively to the public. Because electricity so efficiently meets the constantly recurring needs of the household, saving labor and cutting down fatigue, which is too frequently the forerunner of physical exhaustion, and bringing about economies in the operating costs of the home, the central-station man and the retail appliance dealer have no apologies to make in joining the sales army whose objective is the surplus savings of the family. We are constantly telling the public to 'Do It Electrically' and we are right in this advice, but our rates should be designed to facilitate the widest and most liberal use of electricity in the home.

"In the past," said Mr. Campbell, "rates have too frequently discouraged the use of electricity for other purposes around the home than lighting. The straight-line meter rate per kilowatt-hour with no demand charge penalized the long-hour user and undercharged the short-hour consumer, because the element of overhead expense was overlooked in failing to allocate to such users their fair proportion of the fixed charges. Demand metering is none too satisfactory at present for residences on account of its installation and maintenance costs, and demand charges based on connected load or number of outlets penalize the use of electricity. A low energy charge is an absolute necessity in encouraging the use of residential service, but this used alone exposes us to serious dangers, and we must combine it with some fair measure of the size of the installation in order to cover the fixed charges which loom so large in the cost of serving the small residence customer. By 'small' I mean the user of low totals in kilowatt-hours."

"What form of compound residential rate, then, have you found most desirable in meeting these initial costs and in encouraging larger use of energy?" asked the ELECTRICAL WORLD representative.

"On this system," was the reply, "we instituted a three-part rate in 1915, and this has been modified from time to time to meet prevailing conditions, but since 1920 there has been no change in its basic fig-

ures. This form of rate has proved more satisfactory to the company and its customers than anything we have ever done. We have a customer charge of 50 cents a month, a demand charge of 4 cents per month per 100 sq.ft. of floor area and an energy charge of 5 cents per kilowatt-hour. We use this all through our system. It was optional in the earlier days to use the compound rate, but later we made it compulsory with an alternative of 13 cents per kilowatt-hour, our old rate being 11 cents. We do not claim that this is the only compound rate that will meet the needs of the industry or of our own company; but it is vitally necessary in all compound rates for residential service to care first for overheads and then to attract liberal, even free, use of service by a comparatively low energy charge."

New Rate for Heavy-Duty Service

Mr. Campbell said that this fall another compound rate has been offered the public by the Connecticut Light & Power Company to facilitate the use of electricity for heavy-duty service in the home. This rate consists of a customer charge of $2 per month, plus 8 cents per month per 100 sq.ft. of floor area, plus an energy charge of 3 cents per kilowatt-hour. This schedule is extremely attractive from the electric range, water-heating and refrigeration standpoints and is being well received.

"Could you have gained satisfactory results by reducing a straight kilowatt-hour charge to, say, 6½ cents," questioned the interviewer, "taking into account the entire gamut of electric service in the home?"

"No," replied Mr. Campbell, "the tendency to cut down the flat rate per kilowatt-hour for residences threatens to overburden the industrial rates of a company. If persisted in, it means in time unsatisfactory development of industrial power and heating business in many cases and makes it all the harder to adopt satisfactory compound rates. On the other hand, once we take proper account of the initial costs of serving the home, a compound rate, including intrinsically what has aptly been called a 'come-along' feature (for example, a low energy charge), will stimulate business of a very profitable kind and will free other classes of service from unjust burdens.

"Many executives do not appear to realize that they cannot satisfactorily sell service for appliances under the rate that they charge for lighting, and they have tried to meet the situation by adopting makeshifts like temporary rates, by selling special service and by installing special wiring for ranges. I believe that is wrong. The selling of special wiring imposes a greater expense on the company, which ultimately must be met by the customer. The form of rate should be so devised that you can supply service for any possible use that customers may want to make in the house through one set of wires, through one meter, under one bill and under one form of rate. Compound rates are somewhat complicated, but ours is a complex business. You cannot sell a complex service except under a complicated rate and do justice by your customers.

"As a practical matter, your customers soon forget these complications. If the rate is properly explained to the public—and that is a matter of wide-open publicity, involving the training of employees to answer questions intelligently, the use of the advertising and reading pages of the local press, clearly worded notices and circulars, and plenty of public speaking by officials —your customers quickly get the habit of thinking of the energy rate only in considering the cost of service. Ask the average customer in Waterbury the price of electricity, and he will tell you '5 cents.' And he is not so far off either. He soon learns that the more service he uses the less it costs him in proportion, and that brings me to the results of the compound rate on our own system.

Striking Gains in Residence Service

"In 1919, the year before we adopted the present rate, our average sales per bona-fide residence customer were 221 kw.-hr., producing $23.55 in revenue. In 1924 these were 318 kw.-hr. per year, with a $28.70 revenue. In the five years we had gained 44 per cent in kilowatt-hours and 22 per cent in per customer revenue. During this time we had a very large gain in the number of customers, 24,683 in fact, or 78 per cent. Our resulting average rate was 15 per cent less than it was in 1914. Very rapid growth in customers usually retards the average sales per customer, because the newer patrons are apt to be rather conservative in their use. We do not attribute all this gain to the compound rate, but there is no doubt that a most substantial part of the increase is to be so allocated."

"What do you consider the best way in which to inaugurate such a rate elsewhere?" Mr. Campbell was asked. "What would be a fair figure as to survey costs, and what would you do another time that you did not do so satisfactorily in this case?"

"We believe in actually measuring the areas of the rooms," said Mr. Campbell. "In our case we employed high school students to do this under our supervision, and the results were excellent. Each man carried a tape with a weighted end. He measured only the 'rectangular' projections of each active room, and the data were worked up in our offices. I believe this can be done by almost any company at a cost of not more than one dollar per customer. Another time we would make much more extended use of the press. We ran a school for employees and trained them to answer all the questions about the new rate that we could think of, adding these as new ones came in. Our executives talked many times about the rate; we explained it thoroughly to newspaper editors, teachers, business and professional people generally.

"We had very little trouble, despite the fact that we made the new rate compulsory. We tried to show our customers that we were seeking to furnish them real service at cost, including in that cost a fair return on the investment devoted to their use. We pointed out that we had been supplying many customers in the past at less than cost, and in order to do so we had been compelled to charge many other customers more than we ought to have charged and that we were now endeavoring to equalize rates to protect ourselves and to derive some more revenue than we had before. In Waterbury our pre-war average residential rate was about 10 cents; it was increased by war costs to about 10.5 cents in 1919, and in 1924 it had fallen to 8.6 cents, an earned reduction of nearly 2 cents. It was harder to 'sell' our directors the idea of the compound rate than to convince the public, but there is now a body of experience available for other companies which can be turned to good account in making this change. We do not claim to be the originators of the compound rate, but we at least take the credit of knowing a good thing when we see it!"

Portable Lamps as Load Builders

Burn Many Hours for Decorative Effects — Increased Revenue per Lamp Nearly Ten Dollars per Year—An Immediate Lamp Business of $1,870,000,000

By M. LUCKIESH
Director Lighting Research Laboratory, Nela Park

IN PREVIOUS ARTICLES certain phases of residence lighting have been presented which show that at the present time it is generally far below a standard of adequate and convenient utilitarian lighting which we have termed the conservative ideal. The insufficiency of outlets, discussed particularly in the second article, indicates that homes in general need much more lighting equipment. This still would be true after the obsolete fixtures had been replaced by modern ones as discussed in the third article.

Assuming that all fixtures in the home were of the most approved type we would still need in the average home an additional

5.7 portable lamps
5.5 utilitarian wall brackets
2.9 ceiling fixtures
7.1 convenience outlets
8.0 fixture outlets
900 watts in lamps (bulbs)

These additional requirements are exclusive of attic, closets, exterior and garages or other outbuildings.

PORTABLE LAMPS

The portable lamp has been generally ignored until recently as a load builder for the central station. Many stores which receive no attention or consideration from central-station executives are daily increasing revenue for the electric company by selling many portable lamps. As a load builder it is an "appliance" which, strangely enough, has been underestimated and even ignored. It is the most popular of all lighting equipment, and justly so. It not only has utilitarian value in providing comfortable lighting but it is a vitalized ornament when lighted and even goes on "earning its keep" throughout the day as a pleasing decorative element. It really helps to furnish a home in a manner usually superior to so-called lighting fixtures.

Studies of the past few years reveal the popularity of the portable. Few homes do not have at least one and pretentious homes often have many of them. Without any urging from electrical interests the householder has accepted the portable as desirable equipment and furnishing. There is a steady sale of portables in many types of stores and special sales are not uncommon. As an example of the importance of these sales, let us take the case of a two-day sale in a large department store in Cleveland. More than 2,000 portable lamps were sold in the two days at an average of $20 each. This one sale increased the consumption of electrical energy in the home so that, according to conservative estimates, the net profits of the central station were increased several thousand dollars per year.

Observation shows that portable lamps are not operated only when utilitarian light is desired, as is the case of many fixtures. The householder senses the cheer and the decorative value which a lighted portable provides and therefore there is a tendency to operate it even when it is not being directly used. Lighted ornaments have as much right to exist as pictures and vases. There is also a tendency to operate them in rooms even when no persons are occupying the rooms. Even in bedrooms upstairs some housewives leave them burning for the effect as seen from the street. Why not? Is it not as justifiable to radiate beauty by means of portables at night as by means of shrubbery, well-painted houses, neat lawns, fountains, etc., in the daytime? Further-

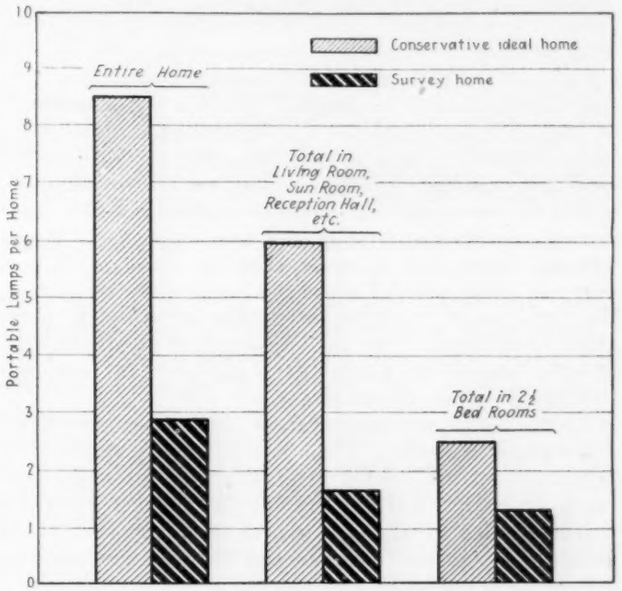


FIG. 1—PORTABLE LAMP BUSINESS POSSIBILITIES
Average number of portable lamps existing in various rooms and in the entire home at the present time. These are compared with the recommendations of utilitarian portables for the conservative ideal home.

more, portables are kept lighted under conditions when fixtures would not be. Even when leaving home for the evening it is a common practice with many persons to leave a portable burning, but it would not occur to them to leave a fixture lighted.

In passing it may be interesting to speculate how much the popularity of the portable is due to the fact that it is always shaded. Certainly, with the exception of an insignificantly few purely decorative ones, portable lamps are always equipped with shades. This means comfortable and pleasant lighting. Why is it, when the pedestal is turned upside down and the fixture is hung from the ceiling, shades are so often omitted? This is a point for the fixture people to study carefully. Instead of trying to combat the portable, the popularity of which is deserved and the greater use of which is inevitable, it would be better for fixture designers to copy its good points. So-called ball-lamp fixtures without

shades are very much at a disadvantage in a competitive bid for popularity where portable lamps can be used at all.

The survey conducted three years ago indicated that there was an average of 1.6 portables per home. A recent survey reveals 2.8 per home. This is in line with observations of its growing popularity and use.

In choosing what we considered to be the most practicable and generally satisfactory lighting equipment for the conservative ideal home, we specified one portable in each bedroom and six portables located in the living room, reception hall, sun room, etc. There being an average of 2.5 bedrooms per home, this makes a total of 8.5 portable lamps for the average home. The average number of portables existing in wired homes at the present time compared with those specified in the conservative ideal is indicated in Fig. 1 for the entire home, for the bedrooms and for the living room and vicinity.

The addition of a 200-watt portable lamp in a campaign conducted by a large public service company in which 4,500 units were sold showed an average increase in annual revenue of $12. In this case the increase in net revenue per customer was $9.34, or nearly 300 per cent. The average increase in annual revenue per portable as reported by sixteen companies which conducted campaigns was $8.26. Any central-station executive may readily compute what this would mean in his case in increased net revenue. In these campaigns about 5 per cent of the consumers were sold portable lamps. Is it not possible for central stations and department stores to co-operate in portable campaigns for their mutual benefit and that of the user of light? If one portable lamp will produce such an increase in net revenue, what will 5.7 more per home do? Of course, the same result is not expected from all the eight portables recommended for the conservative ideal, but this glimpse assures us again that saturation in residence lighting is a far distant event.

According to our conservative ideal, 67,000,000 portables are still needed in the wired homes; 120,000,000 portables will be needed in all the homes within easy reach of central-station service; 200,000,000 portables will be needed in all the homes in this country. At an average of $10 per portable the business available in selling these portables amounts to:

$670,000,000 in the present wired homes;
$1,200,000,000 in all homes within reach of central stations;
$1,941,000,000 in all homes in this country.

In any city in which most of the homes are wired the sale of portable lamps must be equivalent to at least $10 per capita in order to bring this item up to the standard of the conservative ideal.

WIRED FURNITURE

There is a growing tendency in hotels, which should eventually spread to the home, for lighting equipment to be fastened to furniture having mirrors. This is a logical tendency, because it permits a maximum flexibility in arrangement of furniture and simplifies wiring to a great extent. In the construction of apartment buildings and homes, wired furniture in bedrooms, for example, would require only convenience outlets at the important wall spaces and the architect would not find himself dealing with any definite imaginary arrangement of furniture. In many cases little or no consideration is given to arrangement of furniture, with the unsatisfactory result that the householder finds the wall brackets unsatisfactorily located. These difficulties are eliminated in bedrooms and living rooms in proportion to the increased use of furniture with attached lighting equipment and of portable lamps.

CONVENIENCE OUTLETS FOR PORTABLES

As shown in a previous article, there are only 3.4 convenience outlets per home, but 10.5 are recommended in the conservative ideal. The remaining 7.1 per home are badly needed if the popularity of the portable lamp is not to be inhibited. The average living room has less than one and it needs at least three. There is only one convenience outlet in every two dining-rooms, yet small portables are attractive on the buffet. There is only one convenience outlet in about every three bedrooms, yet each bedroom needs a portable lamp. Certainly it behooves the central-station and other electrical interests to direct effort toward increasing greatly the number of convenience outlets. As the use of lighting equipment attached to mirrors increases still more convenience outlets will be needed in the bedrooms.

Rural Electrification in England

THE report of the committee on electricity in agriculture recently made to the Institution of Electrical Engineers contains some tables and data which show that rural electrification is being seriously carried on in England. The report includes the following table, which the committee gives as a reasonable estimate of use on an average farm of 150 acres:

	Kw.-Hr. per Annum
Lighting (house)	100
Lighting (buildings)	150
Motive power, barn and dairy	1,500
Heating and cooking	1,500
Total	3,250

Another table sets out actual consumption figures for 33 farms in a certain area in England as follows:

Motors on each farm, average	1.4
Average horsepower	10
Electric lamps per farmhouse	18
Electric lamps in buildings	18
Average consumption per annum (kw.-hr.):	
Lighting	370
Heating	470
Power	1,370
Average total consumption per annum, kw.-hr.	2,210
Average acreage	230
Average consumption per acre per annum, kw.-hr.	9.5

The report further states that statistics show that the average annual consumption on Continental farms that have used electricity for some years is 22 kw.-hr. per acre.

The cost of electrification was estimated by the committee at about $750 for farm equipment, including three motors aggregating 10 hp., thirty-six electric lights, all necessary wiring and complete household appliances. The cost of distribution lines was placed at between $2,300 and $2,900 a mile for 6,600-volt overhead three-conductor lines. This figure, however, could probably be reduced as low as $1,250 to $2,300 per mile after a study of the most economical construction methods.

The committee believes that farmers will find electricity profitable and will use it widely if they can get it for 8d. (16 cents) per kilowatt-hour for lighting, 2d. for heating and cooking and 4d. for power, with an electric plowing rate from 1d. to 2d. per kilowatt-hour.

Selling a 300-Hp. Brick-Yard Power Load

Annual Consumption of 560,000 Kw.-Hr. with Load Factor of 24 per Cent—Electric Installation Pays Cost in Less than a Year

By MARSHALL V. ROBB
Vice-President Wabash Valley Electric Company, Indianapolis

PLANT OF TERRE HAUTE VITRIFIED BRICK WORKS USING 325 HP. IN CENTRAL-STATION SERVICE

THOROUGH analysis of the prospect's operating conditions and a concise engineering report supported by close personal contact obtained an industrial power load at the Terre Haute Vitrified Brick Company, Terre Haute, Ind., taking more than 500,000 kw.-hr. annually from the lines of the Wabash Valley Electric Company. This plant formerly manufactured paving brick, but at the time the Wabash Valley Electric Company made its industrial survey the plant was being converted to the manufacture of face brick and was undergoing extensive remodeling. In some cases the remodeling of a plant offers the best opportunity for obtaining the installation of central-station service. This was true at the Terre Haute plant, with one important limitation. In converting the yard from one class of manufacture to another, the owners had already spent all the money that had been appropriated for permanent improvements. The advantages of electric drive were known to the management of the plant, but the apparent inability to make further capital expenditures was a serious obstacle.

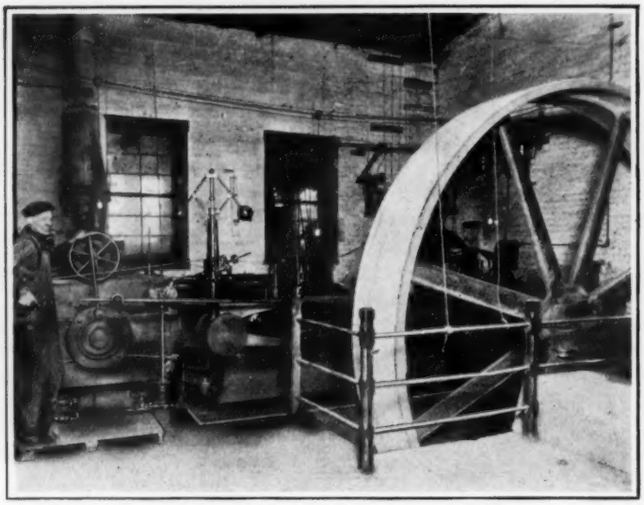
Ascertaining Steam-Power Costs

The central-station's power engineer on this job realized that if the prospect was to be induced to spend several thousand dollars for an electric installation he must be forcibly impressed with the profitable results to be expected from such an expenditure. An earnest effort was therefore made by the central-station's representative to discover the value, in dollars, of every feature of an electric installation for this particular plant.

The largest single item of steam-power cost was coal. Other important elements of expense were power-house labor, maintenance of engines and boilers and extra expense for operating several scattered power installations. No accurate coal records were available. It was therefore necessary to conduct a fuel test over a sufficient period to give a fair basis for estimating the annual coal requirements. A man was detailed to check and weigh the coal for each shift, and the tests were made under as varied operating conditions as could be obtained.

The fuel run was valuable because it indicated the consumption of coal during every period of the day and night. This test showed the proportion of coal to be charged to the various departments. For example, the principal engine in the plant was a 250-hp. Corliss engine on the main drive. Other engines included four fan drives in the waste-heat drier, which had a combined load of 75 hp. The fuel tests showed that while the main engine required seven tons of coal in twenty-four hours, the smaller fan engines required fourteen tons of coal in the same period. This condition is one existing in many brick yards where fans are used to convey waste heat from the kilns to the drier. The reason for this condition is the fact that while the main engine operates perhaps 225 hours per month, the fan engines must operate for 720 hours during the same period.

After determining the fuel to be saved with electric power, the less definite items of maintenance and labor were investigated. In arriving at values for items of this nature the confidence of the superintendent is necessary and his co-operation should be obtained with the end in view that when the figures are submitted to the manager they may be substantiated by the plant superintendent. Lukewarm support by this individual



FIGS. 1 AND 2—250-HP. CORLISS ENGINE AND 20-FT. STEAM-DRIVEN MINE FAN WHICH GIVE WAY TO ELECTRICAL OPERATION

is generally more dangerous than open objections by the general manager. In this case the confidence of the superintendent was obtained through extensive study and observation of plant operating conditions by the power engineer. Before leaving this job the power engineer of the central station could "speak the language" of the brick business well enough to get on with any man in the yard.

In addition to the main plant, there was a pumping station located at the shale pit, nearly a mile from the main buildings. This pumping station had a small steam boiler and engine and required the periodic services of a fireman. The saving to be made through the electrification of this pumping unit was determined and added to the figures for the main plant.

After the operating costs with steam power had been determined, it was necessary to predict the electrical energy requirements and to compute the power bills. In this work the personal experience of the power engineer was reinforced by data that had

Power Engineer's Report Estimates Annual Savings of $7,310 with Purchased Power

Terre Haute Vitrified Brick Company,
201 Arcade Building,
Terre Haute, Indiana.

Attention: Mr. Jos. Entwistle,
General Manager

Subject: Electric Power

Gentlemen—As promised you in our conversation this morning, I am submitting herewith a report on the complete electrification of your brick yard. This report includes an estimate of the cost of motor equipment necessary and also a comparison of operating costs with both steam power and purchased power. This report is based on actual tests made at your plant and upon checks made with other similar installations and shows a saving of $7,300 per year in favor of purchased power.

The equipment necessary to drive your plant would cost $5,500. On this basis the annual saving in operating costs would pay the entire cost of electrification within the first year.

I would appreciate it if you would place this matter before your people for their early consideration.

Very truly yours,

Power Engineer,
Wabash Valley Electric Company.

Report on Complete Electrification

Equipment Required

The following motor equipment would satisfactorily operate your entire plant:

All motors to be three phase, 60 cycle, 440 volts.

Main Drive: One 200-hp., 600-r.p.m., slip-ring motor, complete with out-board bearing, rails, pulley and starting equipment.

Shale Crusher: One 50-hp., 900-r.p.m., slip-ring motor, complete with base, pulley and starting equipment.

Drier Fan: One 40-hp., 900-r.p.m, squirrel-cage motor, complete with base, pulley and compensator.

Pit Pump: One 10-hp., 1,200-r.p.m., squirrel-cage motor arranged for direct connection to centrifugal pump and with compensator.

Shop Motor: One 3-hp., 1,200-r.p.m., squirrel-cage motor with base, pulley and starter.

Blower Motors: Six 1½-hp., direct connected to fans. (Now installed.)

Total cost of motors	$4,000
Cost of wiring	1,500
Total cost of electric installation	$5,500

Present Steam Power Costs

Coal—From actual tests made at your plant, the daily consumption of coal averages 20.4 tons every twenty-four hours with the factory in regular operation and producing 45,000 bricks per day. On Sundays and other days, when only the fans are running, the coal consumption averages 14.4 tons in twenty-four hours. On the basis of 250 working days for the factory and 300 days for the fans, the annual coal consumption in the power plant amounts to 5,820 tons.

Annual coal cost at $2.50 per ton		$14,550
Labor:		
Chief engineer	$1,800	
Three firemen	3,600	
Annual labor cost		5,400
Maintenance:		
Boiler maintenance	$1,000	
Engine maintenance	500	
Supplies and repairs	500	
Annual maintenance of power plant		2,000
Pumping:		
Annual cost of labor and materials for pumping		1,500
Total annual steam power costs		$23,450

Costs With Purchased Power

Coal:	
An allowance of 200 tons for building heating, annual coal cost at $2.50 per ton	$500
Labor:	
Chief engineer	1,800
Maintenance:	
Motor and wiring maintenance	100
Power Bill:	
With complete electrification	13,740
Total annual power costs with purchased power	$16,140

Summary of Power Costs

	Steam Power Costs	*Purchased Power Costs*
Coal	$14,550	$500
Labor	5,400	1,800
Maintenance	2,000	100
Pumping	1,500	.....
Power bill	.....	13,740
Totals	$23,450	$16,140

Difference, or annual saving with purchased power $7,310.

The saving with purchased power would pay for the entire cost of electrification within the first year.

appeared from time to time in the ELECTRICAL WORLD. Every source of information was drawn upon in arriving at a composite estimate of power costs with electric service. Engine indicator cards were also used as guides in determining actual power requirements.

ELECTRICAL EQUIPMENT

Motor equipment was selected with an idea of balancing the fixed charges resulting from the initial investment against operating costs under different methods of drive. A single motor of 200-hp. rating was selected for the main drive. This motor was installed on a foundation built over the flywheel pit of the old engine and the same belt was used on the motor that had been used on the engine. A three-bearing motor was used on account of the width and considerable weight of the belt. This drive was determined upon only after careful consideration of all the possibilities open for driving the factory. A 50-hp. motor was separately connected to a large shale crusher. This crusher was oversize and operated intermittently and was, therefore, suited to individual drive. Two of the engine-driven fans in the drier were replaced by a low stack for carrying off the moisture from the drier, while the two large fans taking hot gases from the kilns and discharging into the drier were replaced by one small-diameter, modern multiblade fan, belted to a 40-hp. motor. The final arrangement of the drier ventilating system decreased the power requirements by 50 per cent and improved the drying conditions. In the yard an interesting application of motor drive was the operation of small individual forced-draft blowers at each kiln. These blowers increased the combustion efficiency and greatly reduced the time required to complete a kiln of bricks. The blowers were direct-connected to 1½-hp., squirrel-cage motors.

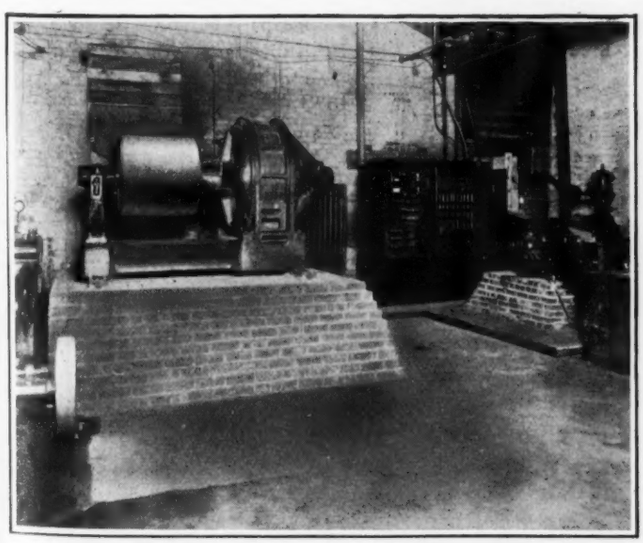
POWER REPORT SUBMITTED

When all the facts bearing upon the cost of power had been determined, they were submitted in a report as shown on page 1254.

When the electric installation had been completed, load tests were made by the central-station's representative in co-operation with the representative of the motor manufacturer. The purpose of the tests was to check up on actual load conditions and indicate any possible changes or improvements in the installation. During the first few weeks of operation from a new transmission line there are often interruptions and annoyances to the customer of one kind or another. Consequently the power engineer had here an opportunity to help the customer keep his equipment in operation and at the same time help the company keep the good will of the customer.

It is sometimes possible to predict accurately the motor performance and power bills. The estimated annual power bill for this plant was $13,740 and the actual bills have been running at the rate of $13,500 per year, showing that the estimate was within 2 per cent of the actual power cost. The monthly consumption averages 47,000 kw.-hr. with a load factor of 24 per cent.

FIG. 5—ONE OF SIX MOTOR-DRIVEN KILN FANS USED TO REDUCE BURNING TIME



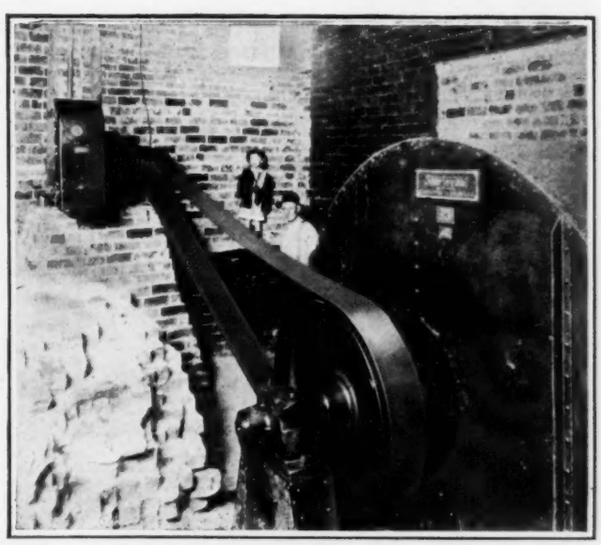


FIG. 3 (AT LEFT)—200-HP. MAIN DRIVE MOTOR AND 50-HP. SHALE-CRUSHER MOTOR. FIG. 4 (AT RIGHT)—40-HP. MOTOR DRIVING 66-IN. FAN REPLACES 20-FT. STEAM-DRIVEN FAN

Industrial Load of the South

Manufacturing Plants as a Whole Are 50.6 per Cent Electrified—Private Plants Number 1,458, with a Total Generator Rating of 735,304 Kva. — Central Station Supplies 66.5 per Cent of the Energy Consumed

ONE of the outstanding national economic developments of the past ten years has been the industrial advance recorded by the Southern States. The South has always been regarded as an agricultural and mining section furnishing the nation with its cotton and tobacco, with lumber, with coal and with a large portion of its crude oil. But since 1913 a new South has come into being and a new economic structure has been built up which has as its foundation the development of the section's manufacturing potentialities.

The great strides made in industrial growth by the South are clearly pictured in the accompanying tabulation, which is based on an industrial survey just completed by the ELECTRICAL WORLD as a part of a nation-wide study of the present status of industrial power. Lack of space makes it impossible to publish the detailed data for each of the Southern States in these columns, but the state figures have been issued in pamphlet form and will be sent to anyone upon request. A detailed analysis of the industrial load of New England, the Middle Atlantic and the North Central States appeared in the issues of September 12, October 10 and November 14, 1925, respectively, and detailed data on the individual states in these sections of the country are also available upon application.

SOUTH STILL HAS A LARGE POTENTIAL FIELD OPEN FOR DEVELOPMENT

The rating of the power machinery installed in the manufacturing establishments of the Southern States has increased by 1,472,685 hp., or by 33 per cent, during the past ten years, the installed power at the opening of 1924 totaling 5,914,887 hp. Based upon returns received in the survey, the estimate is made that 793,927 hp. of this power is installed in private electric generating plants and that 2,202,447 hp. is in electric motors run by energy purchased from central-station lines. Using these figures as a basis, it is estimated that industry as a whole in the Southern States is now 50.6 per cent electrified. That the South still has a large potential industrial field available for immediate development is indicated from the fact that the degree of electrification mentioned is the lowest of any section in the country, New England reporting 58.2 per cent electrification, the Middle Atlantic States 59.6 per cent and the North Central States 64 per cent. There is no doubt that the next five years will witness a material increase in the electrification of Southern industry.

ONE-THIRD OF THE ENERGY CONSUMED IS GENERATED IN PRIVATE PLANTS

The Southern States report 1,458 private industrial electric generating plants, with a total generator rating of 735,304 kva., of which 555,640 kva. represents alternating-current machines and 179,664 kw. direct-current machines. The industrial plants of these seventeen states, including the District of Columbia, consumed 4,177,885,000 kw.-hr. of electrical energy in 1924, of which 66.5 per cent was purchased from central stations and 33.5 per cent was generated in private plants. Only one section, the Mountain-Pacific States, reported a smaller percentage of privately generated energy.

There are 250,823 electric motors installed in the industrial plants of the section, with a total rating of 3,205,369 hp., of which 76 per cent is the rating of alternating-current motors and 24 per cent that of direct-current motors. This is the lowest percentage of direct-current motor rating reported by any section except New England, where only 14.7 per cent of the total motor rating was in direct-current motors. Approximately 52.4 per cent of the motors in the factories of the Southern States are rated under 5 hp.

The present status of the industrial power in the Southern States is best shown by considering the various industries. This section, constituting almost a

Table I—Distribution of the Industrial Power Load in the Southern States as of Jan

Industry	Total Primary Horsepower	Primary Horsepower Owned by Establishments Reporting: Steam Engines (Not Turbines)	Steam Turbines	Internal-Combustion Engines	Water Turbines	Electric Motors Run by Purchased Energy, Hp.	Electric Motors Run by Energy Generated in Private Plants, Hp.	Boilers: Number	Boilers: Hp.	Number of Companies Having Private Electric Generating Plants	Estimated Rating of Prime Movers Used in Private Generating Plants, Hp.
All industries	5,914,887	2,779,333	431,154	219,683	282,270	2,202,447	1,002,922	14,324	3,037,716	1,458	793,927
Chemicals and allied products	866,304	337,528	63,406	32,340	110,349	322,681	154,538	2,515	525,810	168	126,644
Food and kindred products	818,163	420,607	20,912	73,111	23,148	280,385	59,915	2,904	705,380	423	103,777
Iron and steel and their products, not including machinery	799,010	332,140	137,155	36,404	1,713	291,589	295,399	402	172,943	59	150,185
Leather and its finished products	42,712	20,962	4,035	208	440	17,067	7,673	348	55,915	20	8,929
Lumber and allied products	1,140,836	953,263	53,231	13,280	1,011	120,051	100,251	5,182	844,410	285	92,265
Machinery	110,193	16,748	1,519	10,277	325	81,324	13,077	154	35,597	59	9,233
Metals and metal products other than iron and steel	95,012	15,489	4,339	2,400	0	72,784	12,099	63	23,125	12	15,700
Musical instruments and phonographs	1,268	409	316	0	0	543	574	2	518	2	516
Paper and printing	189,649	67,566	29,267	2,659	14,303	75,854	57,060	141	57,569	54	61,364
Railroad repair shops	184,910	64,865	14,941	2,629	0	102,475	51,837	365	96,415	62	31,771
Rubber products	23,731	15,705	981	10	0	7,029	14,466	12	5,486	1	7,790
Stone, clay, and glass products	306,015	117,306	14,201	31,441	7,766	135,301	60,752	523	109,570	98	49,849
Textiles and their products	1,123,548	346,684	75,468	9,014	123,065	569,317	150,121	1,263	317,532	176	113,512
Tobacco manufactures	23,165	13,910	3,746	151	0	5,358	11,098	184	29,447	16	7,189
Transportation equipment, air, land and water	130,701	32,945	2,962	4,106	0	90,688	11,799	122	38,481	16	12,929
Miscellaneous industries	59,670	23,206	4,669	1,653	150	29,992	2,263	144	19,518	19	2,274

third of the gross area of the nation, is a section of many varied industries, but five primary industries stand out. These leading industries in the order of their importance are: Lumber and allied products, textiles, chemicals and allied products, food and kindred products, and iron and steel and their products not including machinery. In only two of these is the private plant the near-controlling factor, these being the iron and steel industry and the lumber industry, which reported 49.8 per cent and 48.3 per cent respectively privately generated energy.

The lumber industry, which reports the largest amount of installed power—1,140,836 hp.—is now only 18.6 per cent electrified. Last year these mills consumed a total of 293,946,000 kw.-hr., of which 51.7 per cent was purchased from central-station companies and 48.3 per cent was energy generated in private plants. The rating of the generators in these power plants total 85,432 kva.

Textile Mills of the South Are More Highly Electrified than Those of New England

The textile industry, the manufacturing industry second in importance in the Southern States in so far as the amount of installed power is concerned, is 60.7 per cent electrified. This degree of electrification is considerably higher than that reported for the textile industry in New England—46 per cent. Of the 443,696,000 kw.-hr. of electrical energy consumed by the textile mills in 1924, 79 per cent was purchased from central-station companies. In New England only 46 per cent and in the Middle Atlantic States only 62.7 per cent was purchased from central-station companies. The textile mills of the South have a total of 115,587 electric motors installed, of which 71,364 are rated under 5 hp.

The State of North Carolina reports by far the largest total power installation, with 702,832 hp., of which 69,301 hp. is in private electric generating plants. Industry in the state, however, is only slightly more than one-half electrified—54.2 per cent to be exact. The manufacturing plants of the state consumed a total of 311,264,000 kw.-hr. of electrical energy in 1924, of which 76 per cent was purchased from central-station companies. It would appear, therefore, that the central-station companies operating in North Carolina have the power situation well in hand and that the private generating plant is not a vital factor in the state.

Alabama, although reporting the second largest power installation in manufacturing plants—640,892 hp.—is yet only 41.2 per cent electrified. The iron and steel industry is by far the largest manufacturing industry operating in Alabama, with a total power installation of 305,116 hp., of which 32.5 per cent is electrified. Of the 189,350,000 kw.-hr. of electrical energy consumed by these mills in 1924, less than one-third was generated in private plants. In Pennsylvania, another state in which the iron and steel industry predominates, three-quarters of the energy consumed by these mills were generated in private plants. The textile mills in Alabama are also very large users of electrical energy, consuming 91,110,000 kw.-hr. during 1924. The textile mills of the state are 66.2 per cent electrified.

Industries of Maryland Rate with Highest in Country in Degree of Electrification

Maryland reported the highest degree of industrial electrification, with 79.5 per cent—in fact, this is the highest electrification of any state in the Eastern section of the country. It is exceeded only by Montana and California, with an 83.9 per cent and 81.3 per cent electrification respectively. A total of 657,608,000 kw.-hr. of electrical energy was consumed by the manufacturing plants of Maryland during 1924, of which 58.5 per cent was purchased from central stations. Iron and steel plants, the most important industry in Maryland, are 92.5 per cent electrified and consumed a total of 309,600,000 kw.-hr. of electrical energy during 1924. There are 6,970 electric motors installed in the iron and steel mills of Maryland, with an aggregate rating of 233,495 hp.

The manufacturing companies covered in the survey reported twenty-four different voltages in use and four frequencies. This is materially under the voltages in use in other sections of the country, the Middle Atlantic States reporting thirty-three different voltages and ten frequencies. This condition is to be expected, however, in a section with comparatively low private plant development.

No section of the nation offers greater possibilities for the future development of the central-station load than these Southern States. Not only is there a large potential load still undeveloped, but these states contain over 13 per cent of the potential water powers of the nation of which only 28 per cent has been developed.

tates as of January 1, 1924, and Energy Consumed by Industrial Plants During 1924

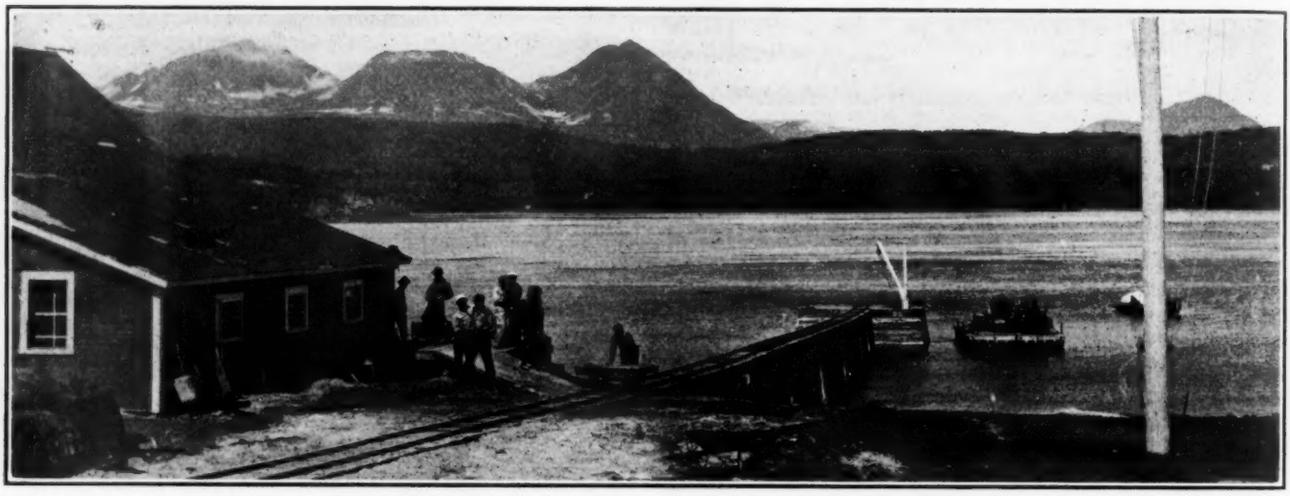
Number of Companies Having Private Electric Generating Plants	Estimated Rating of Prime Movers Used in Private Generating Plants, Hp.	Estimated Electrification of Industry, per Cent	Energy Consumed			Generators in Private Plants			A.C. Motors		D.C. Motors		Motors Under 5 Hp.	
			Total Energy Consumed, Kw.-Hr.	Purchased from Central Stations, Kw.-Hr.	Generated in Private Plants, Kw.-Hr.	Total Rating of Generators, Kva.	Rating of A.C. Generators, Kva.	Rating of D.C. Generators, Kw.	Number	Hp.	Number	Hp.	Number	Hp.
1,458	793,927	50.6	4,177,885,000	2,785,745,000	1,392,140,000	735,304	555,640	179,664	163,258	2,433,518	87,565	771,851	131,467	284,271
168	126,644	51.8	1,000,063,000	659,111,000	340,952,000	117,330	91,730	25,600	18,820	412,303	3,208	64,916	11,706	23,776
423	103,777	47.0	473,493,000	392,600,000	80,893,000	96,055	36,275	59,780	8,404	153,560	23,835	186,740	14,887	40,606
59	150,185	55.4	801,126,000	402,615,000	398,511,000	139,090	125,144	13,946	8,595	394,333	6,784	192,664	3,039	8,759
28	8,929	60.8	42,894,000	29,592,000	13,302,000	8,272	4,051	4,221	1,194	20,007	248	4,733	407	1,387
285	92,265	18.6	293,946,000	151,744,000	142,202,000	85,432	65,300	20,132	12,157	204,455	873	15,847	4,398	13,529
39	9,233	82.2	72,761,000	62,805,000	9,956,000	8,547	4,677	3,870	3,071	49,270	3,048	45,131	3,562	8,294
12	15,700	93.2	128,849,000	108,806,000	20,043,000	14,550	7,920	6,630	2,019	59,474	1,243	25,409	857	2,479
4	516	83.5	800,000	379,000	421,000	478	382	96	49	716	43	401	67	200
54	61,364	72.4	214,592,000	132,098,000	82,494,000	56,850	48,188	8,662	2,425	109,982	2,877	22,932	3,306	8,081
62	31,771	72.6	140,638,000	91,729,000	48,909,000	29,409	21,832	7,577	6,299	128,843	1,760	25,469	3,874	12,072
1	7,790	62.5	14,601,000	4,781,000	9,820,000	7,220	7,030	190	681	17,955	219	3,540	530	1,200
98	49,849	60.5	435,436,000	301,465,000	133,971,000	46,149	38,260	7,889	4,544	179,105	1,597	16,948	1,783	4,394
176	113,512	60.7	443,696,000	351,152,000	92,544,000	105,183	102,653	2,530	89,588	672,735	25,999	46,703	71,364	124,538
16	7,189	54.2	11,080,000	3,607,000	7,473,000	6,658	952	5,706	2,960	6,191	2,444	10,265	2,855	6,645
10	12,929	79.3	71,655,000	63,269,000	8,386,000	11,980	1,246	10,734	1,444	19,438	7,967	83,049	3,099	7,945
19	2,274	54.0	32,255,000	29,992,000	2,263,000	2,101	0	2,101	1,008	5,151	5,420	27,104	5,733	20,366

Naval Experience in Laying Submarine Cable

Some of the Fundamental Principles Developed by the United States Navy While Laying and Maintaining Alaskan Cables

By Frank Luckel
Lieutenant Commander, U. S. Navy

UPON many occasions the navy has been called upon to lay, recover or cut submarine cables, though the length of the cable laid has rarely been more than twenty miles. Although special equipment and experienced personnel are desirable for laying or recovering cable, they are seldom or never available in the service, and improvised methods have been most frequently used. The navy has laid and maintained several submarine cables in Alaska, and some of the elementary considerations, of course, apply to laying a submarine cable across any bay, harbor, strait or river.



TWO-SECTION PONTOON USED IN LAYING KODIAK-CORDOVA CABLE IN ALASKA

In laying out the route for the cable, the most direct route between suitable cable landings should be chosen, giving consideration, however, to the following difficulties: (1) Intervening islands, (2) shoal or broken waters, (3) unusually deep channels, (4) reefs, (5) rocky bottom, (6) heavy seaweed, (7) strong currents, (8) anchorage areas. Under certain conditions it is necessary to overcome the difficulty encountered, but ordinarily it is better to avoid it when possible. Cables laid over rocky reefs or submerged ridges, through an anchorage area or in a stream with a heavy current are extremely liable to insulation trouble due to chafing.

In laying the cable, it should be coiled down on a pontoon or flat platform built over two medium-sized boats in such a position that no kinks or twists in the cable will be introduced. By using care a surprising amount of cable can be coiled in a small space. The braking device to be installed consists of a heavy wooden lever that can be pressed down to grip the cable as it passes through a groove or notch. The groove should be large enough to take any splices that may be made in the cable. A complete set of tools, such as crowbars and hatchets, should be kept ready and a crew of about eight men will be found necessary for the work of paying out the cable.

Two power boats should be used to tow the pontoon, as there will be difficulty due to the drag of the cable if only one boat is used for towing. The actual laying of the cable should be done during slack water, and when once started it should be pushed through to completion with the least possible delay. Pressure should be applied to the cable by means of the brake at intervals in order to be sure that the cable is laid straight. The cable should be made fast at one end and paid out steadily, and if there is more cable than is necessary when the farther shore is reached, it can best be preserved by being laid in a bight under water where it will be available for future requirements.

After the cable is laid, the shore ends should be securely fastened to posts. Where spliced to the aërial wire, they should be bent down in a gooseneck to guard against water finding its way into the cable. The two cable landings should be prominently indicated by "Cable Crossing" signs. A complete map or chart should accompany the report of the laying of the cable and should give complete and definite information as to the location of the cable, any difficulties met in laying it, and any other information that would be valuable in case it later becomes necessary to repair or recover the cable.

Proposed 130-Kv. Transmission Lines Across the Straits of Messina

A SCHEME is at present under consideration to supply electricity to the island of Sicily from the hydro-electric power station in Calabria, the southern province of Italy. Three plans for conveying current at 130,000 volts tension across the Straits of Messina, which at the narrowest point are 2.15 miles wide, have been prepared.

The first provides for an overhead line supported at each end on steel towers 993 ft. high. It is estimated that there would be a sag of 770 ft. from the horizontal in the center of the line. The second scheme provides for the construction of two 656-ft. shafts and a 2⅜-mile tunnel below the Straits at a distance of 378 ft. below sea level. The third scheme is that of the Pirelli Company of Milan, which proposes a new type of submarine cable. This cable, although laid on the bed of the sea, would, it is claimed, be capable of successfully transmitting the necessary electrical energy.

Central Station and Industrial Practice

Centralized Supervision of Automatic Substation System

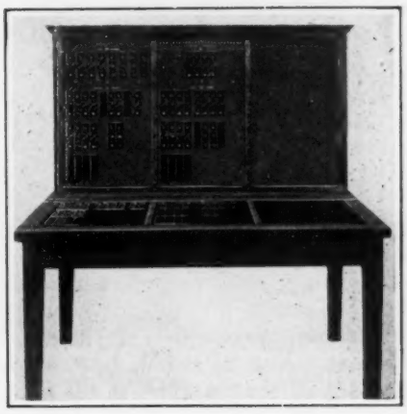
By R. J. Wensley
Switchboard Engineering Department,
Westinghouse Electric & Manufacturing Company

SUBURBAN railway transportation requires that several factors be given consideration in operating automatic substations converting high-potential alternating-current power to 600-volt direct current. It is desirable that the load should regulate the output of the various stations, yet it is also advisable that human control should be possible, for automatic equipment cannot modify its cycle of operations under unusual conditions. As a matter of necessity, information as to the status of the power system must be had at all times. To give these "human" powers of communication to the automatic substation and to provide means by which human may supersede automatic control if desirable, a supervisory control system was designed and installed to operate both on the Staten Island Rapid Transit Company's control system of substation converters and upon the 33,000-volt transmission system of the Staten Island Edison Company supplying the railway converters.

Both sets of distant control desks are housed under one roof, but are presided over by entirely independent operators. This condition is possible because the Livingston substation and generating station of the Staten Island Edison Company is but a few hundred feet from the St. George substation and controlling offices of the railway company. Because of the fact that both control units are located in such close proximity and because they control apparatus in the same distant substations, one set of cables serves both control systems, similar to a two-party city telephone line.

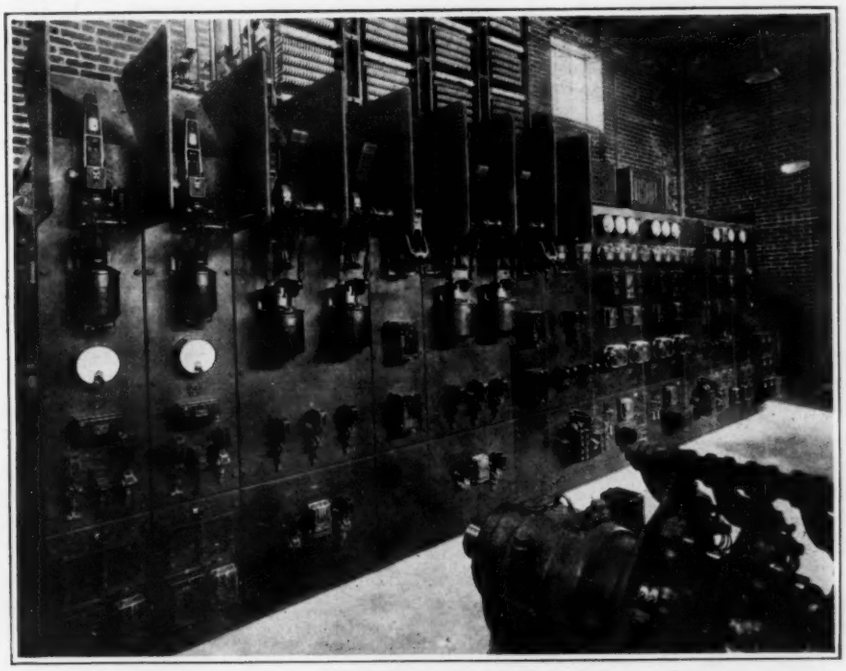
The supervisory control equipment, known as the synchronous visual type, provides, on the traffic operator's control desk, a control key and indicating lamps for each device in each station for which supervisory control has been provided. From his desk in the St. George stations of both companies, four wires, constituting two pairs of a telephone cable, radiate to each of the four automatic substations. A similar installation has been made at each substation. Associated with the lamps and keys, by which their operations are controlled, are groups of small multicontact control relays mounted apart from the desk in a steel cabinet. At the substation end of the system, circuits through these small relays energize or de-energize auxiliary relays, which in turn cause the devices in the stations to function in response to the operations at the control desk initiated by the traffic operator.

Two of the four wires in the control circuit provide a step-by-step circuit by which similar relays at each end of the line are operated simultaneously in such a way as to keep a series of relays, each effecting the operation of the next relay in the series, in absolute synchronism. Each of these relays, which is provided with a group of contacts, is assigned to one particular control circuit in the substation and to the corresponding lamp and key circuits at the traffic operator's control desk. As each relay operates, a pair of its contacts are momentarily connected to the two other wires of the line.



TRAFFIC OPERATOR'S CONTROL DESK AT ST. GEORGE SUBSTATION

If it is desired to operate any one of the circuits, the change in position of the control key arrests the operation of the chain of relays after it has progressed to that position in the sequence. Thus the second pair of wires constitutes, through the contacts of the relay at each end of the circuit, a direct metallic circuit by which the auxiliary relay in the



INTERIOR VIEW OF SUBSTATION, AUTOMATICALLY CONTROLLED AND SUPPLEMENTED BY SUPERVISORY SYSTEM CONNECTED TO BOTH THE STATEN ISLAND RAILWAY OFFICE AND THE LIVINGSTON GENERATING STATION OF THE STATEN ISLAND EDISON COMPANY

substation is energized or de-energized to effect the operation intended. Immediately following the functioning of the device, the lamp indication is returned through the same circuit, after which the relay chain is released to complete its sequence. Normally all equipment in the supervisory system is at rest. It functions only in response to operations initiated by the traffic operator or the automatic operations of the substation equipment.

By means of this system the traffic operator may open or close any of the main power circuits either on the primary side of the power transformers or on the supply from the direct-current bus to the third-rail sections. Also he is able to start or stop any of the machines in the automatic stations. In addition to control over breakers at various points on the system, through which power is supplied to the signal system, he also has an indication of the position of oil circuit breakers on the 3,300-volt system which are operated by the power company.

The operation of sending a signal to the traffic operator to indicate the automatic functioning of a device at the substation is a duplicate of that initiated by the traffic operator, except that it is initiated electrically through auxiliary contacts on the device itself. Power for operation of the supervisory control equipment is supplied from small 48-volt storage batteries installed at each substation. Should the supervisory control system for any reason fail to function, the stations remain under full automatic control.

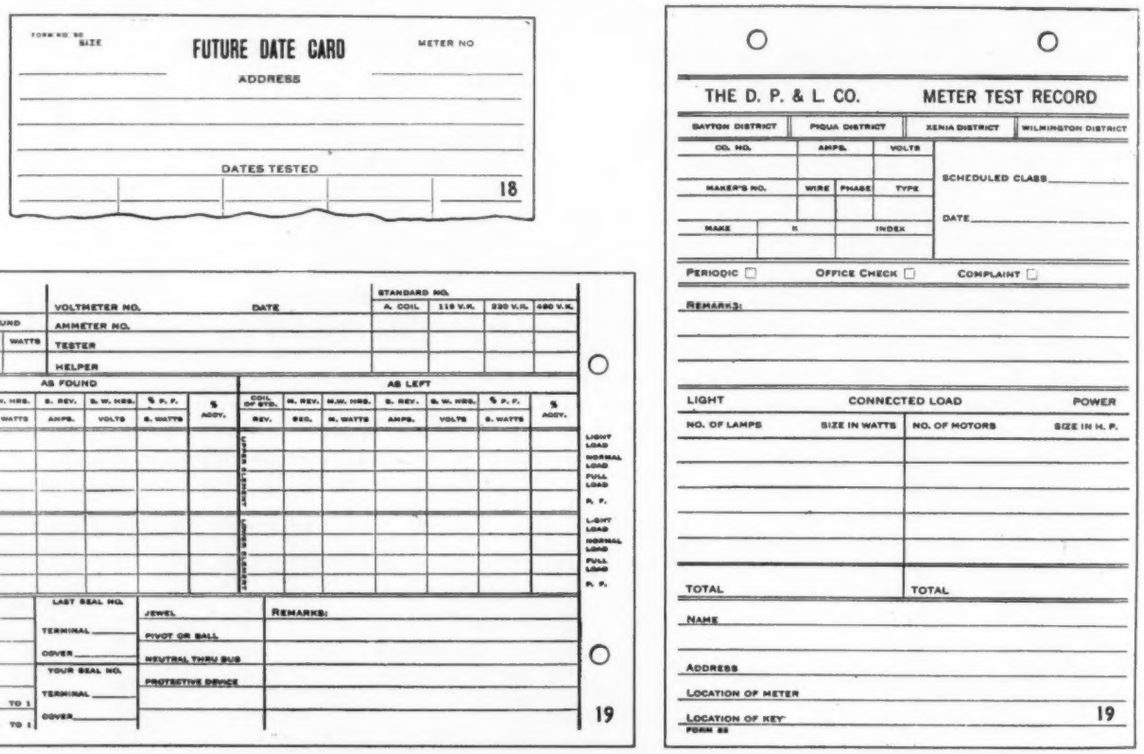
Periodic Meter Testing

BY KARL H. BAUSMAN
Supervisor of Meter Department Dayton Power & Light Company

THE experiences of the Dayton Power & Light Company in methods that expedite meter work were described in the ELECTRICAL WORLD for November 28 and December 12, on pages 1093 and 1212 respectively. As regards the periodic testing of meters the practice given below is followed:

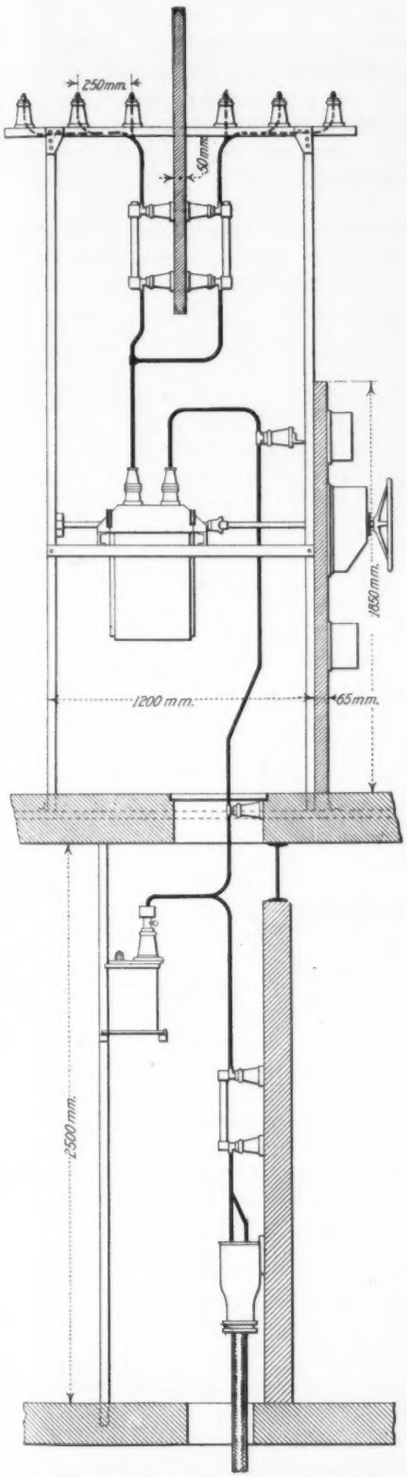
From experience regarding the maintenance of meter accuracy, it has been possible to classify meters for periodicity of testing. From this classification, cards scheduling the future dates of periodic tests (Fig. 18) are made out for each meter when the meter is installed. This includes all meters except single-phase up to 25 amp. White cards are used to indicate intervals of eighteen months, buff cards for twelve months, blue cards for six months, and salmon cards for three months. These cards are segregated according to type of service—direct-current, single-phase or polyphase—and kept in separate files arranged alphabetically by streets and further classified by street number.

Periodic tests for single-phase meters up to and including 25 amp. are printed on the test record (Fig. 19) from the route book addressograph links. Routes are laid out for the meter testers so that they will not have to jump all over town, starting at the service building and spreading out over territory, so that all meters will be tested in a period assigned to that meter. To avoid loss of records, these cards are not issued to the meter tester. Instead, meter test records (Fig. 19) are filled in with the location of the meter, the meter number and size taken from the future date card. After making the test and filling in the data required on these records, the meter tester returns the slip to the office for checking, after which the record finds its way to the primary inspection clerk, who makes a notation on the future date cards of the date of the test. The meter test slips are held for making monthly records of meter accuracy. These test slips eventually find a resting place in the meter envelope (Fig. 1).



METER TEST RECORDS USED BY DAYTON POWER & LIGHT COMPANY

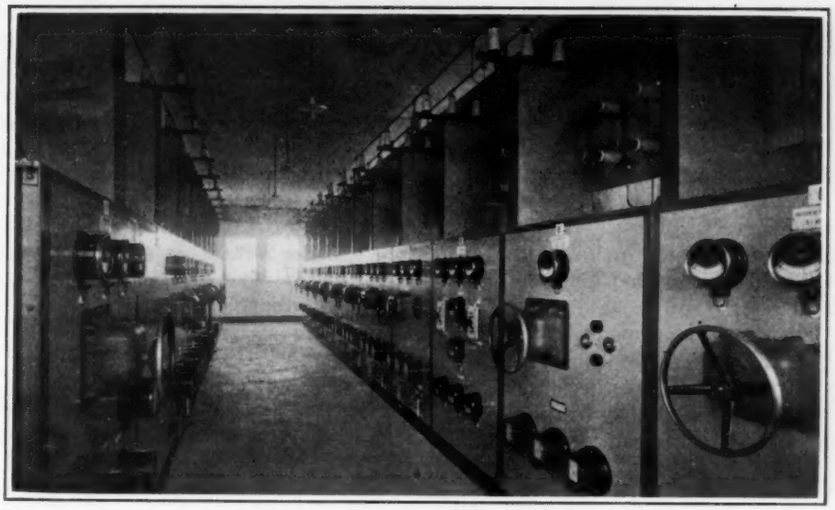
Fig. 18—Cards scheduling dates of periodic tests. Salmon cards are used for tests conducted every three months; blue for six months; buff for twelve months; white for eighteen months. Fig. 19—Periodic test record.



CROSS-SECTION OF TYPICAL OUTGOING 3,000-VOLT FEEDER

Concrete Walls Used for Substation Switchboards

THE Société d'Electricité of Strasbourg, France, is now laying out substations in a way which permits using the concrete walls as switchboards. It is claimed that this saves much room, saves connecting leads and permits the placing of switchboard apparatus as nearly as possible in front of the cell inclosing the corresponding high-tension equipment.



CONCRETE WALLS USED AS SWITCHBOARDS

The wall is covered with a layer of yellowish gray oil paint and limiting lines of black paint to give a neat appearance. The apparatus is bolted directly by expansion bolts set in the concrete and the leads go through small porcelain tubes. Mr. West, chief engineer of the company, is well satisfied with the results obtained and the saving in space and investment.

Motor-Driven Paper Cutter Operates Automatically

CORRUGATED paperboard for shipping cartons is made on a machine into which two strips of paper and a third of straw paper are fed. As it enters the machine, the straw paper is dampened by steam jets and then is pressed between heated corrugated rolls to put the permanent corrugations in it. Finally the two strips of paper are attached to each side of it and the glue is dried as the newly formed paperboard moves along on the belt in a continuous strip. This board is not flexible, so it is cut into sheets as it leaves the end of the machine by a blade set in a revolving cylinder, driven through a train of gears by an electric motor. The paperboard that is being cut moves along without stopping between the two cutting blades.

Since the cylinder of the cutter revolves at high speed as compared with the movement of this board, it must come to a dead stop after a cut and then, following a short delay to permit the board to move the correct distance, must be accelerated to cutting speed and then brought to a full stop again. All of this accelerating, cutting and braking constitutes but one revolution.

An "electrical chain," the links of

MOTOR-DRIVEN PAPER MACHINE STARTED, STOPPED AND STARTED EVERY TWO SECONDS

which are several wires, a pair of contactors and a motor starter, makes up the heart of this apparatus and synchronizes the movement of the cutter to that of the board. The timing action centers at a pair of contacts mounted on a small rubber-tired bicycle wheel, which rides on a long tapered pulley. This pulley is direct connected to the main feed of the machine so that the timing contacts open and close in direct relation to the movement of the paperboard. The time interval between cuts, and therefore the length of the board cut, is varied by moving the wheel along this cone.

When these contacts are brought together, the motor that drives the cutter is automatically accelerated to full speed through a direct-current starter manufactured by the Electric Controller & Manufacturing Company of Cleveland, Ohio. The knife travels past the cutting point and a pair of contacts mounted on the cutter opens the motor circuit and closes it again through a dynamic breaking circuit. Almost immediately the knife is brought to a stop.

The corrugated paperboard travels at a speed of about a foot a second, so, when a 2-ft. length is being cut, the motor driving the cutter is started, stopped and started again every two seconds.

Basis for Judging Operating Performance

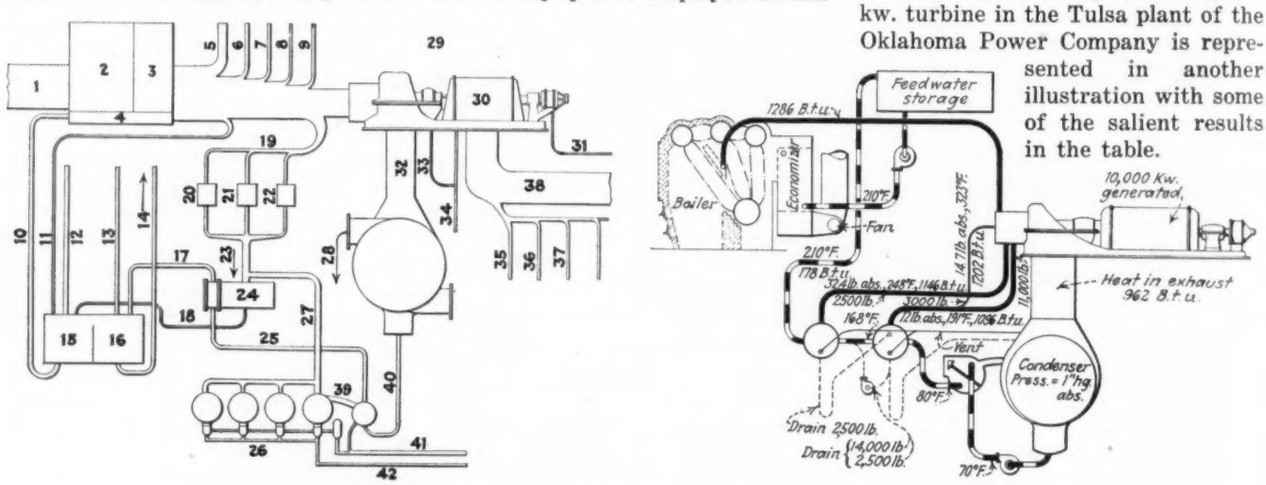
BY JAMES F. BROWN

Oklahoma Power Company, Tulsa, Okla.

ACCOUNTING for every B.t.u. from the point at which potential energy is introduced through the various equipment employed to convert it into electric power, or establishing a heat balance at different loads when new units are installed, affords a standard by which the operating force can judge results after the plant has been placed in normal operation.

Furthermore, it enables more intelligent judgment of what needs attention when results depart therefrom. The first requirement is that such heat balances be kept in front of the operating crew and the second that enough test instruments be left installed to enable comparisons with later operation.

Such a heat balance for a fully loaded 5,000-kw. generator fed from two boilers at a steam pressure of 225 lb. and superheat of 150 deg. F. is presented herewith in graphic form with tabular interpretation. Performance of a fully loaded 10,000-kw. turbine in the Tulsa plant of the Oklahoma Power Company is represented in another illustration with some of the salient results in the table.



PERFORMANCE STANDARDS OF A 5,000-KW. AND 10,000-KW. TURBINE FULLY LOADED

5,000-Kw. Unit

1. Fuel oil, 5,420 lb. per hour; B.t.u. per lb., 19,400; B.t.u. in fuel per hour, 105,148,000.
2. Boilers on line, two; steam pressure, 250 lb.; superheat, 175 deg. F.; evaporation per hour, 69,842 lb.; boiler, furnace and high pressure economizer efficiency, 76.7 per cent; inlet water temperature, 204 deg. F.; outlet gas temperature, 545 deg. F.
3. Low pressure economizer inlet water temperature, 133 deg. F.; outlet gas temperature, 397 deg. F.; efficiency due to economizer, 4.3 per cent.
4. Over-all efficiency, 81 per cent.
5. Boiler, stoker, stack and radiation loss, 13,302,365 B.t.u.
6. Soot blower loss, 12,710 B.t.u.
7. Economizer blow-off, 25,000 B.t.u.
8. Boiler blow-off, 63,550 B.t.u.
9. Line radiation loss, 1,000,000 B.t.u.
10. Feed to high pressure economized, 70,675 lb. at 204 deg. F., 11,567,000 B.t.u.
11. High pressure steam required 1,500 lb.
12. From low pressure economizer, 66,500 lb. at 179.4 deg. F.
13. Make-up water 2,500 lb., 445,000 B.t.u.
14. To low pressure economizer.
15. Hot compartment, 69,842 lb., temperature, 204 deg. F., 12,012,824 B.t.u.
16. Cold compartment, 66,500 lb., temperature 133 deg. F., 6,716,500 B.t.u.
17. Condensate 130.5 deg. F., 64,000 lb.
18. Condensed exhaust steam, 1,842 lb., 128,940 B.t.u.
19. Auxiliary steam, 2,675 lb., 3,001,270 B.t.u.
20. Boiler feed pump, 1,260 lb.
21. Service pump, 600 lb.
22. Oil pump, etc., 815 lb.
23. 1,842 lb., 1,937,784 B.t.u.
24. Temperature rise in heater, 28.5 deg. F.
25. Condensate temperature, 102.5 deg. F., 4,512,000 B.t.u.
26. Evaporator.
27. Exhaust steam to evaporator 833 lb., 926,000 B.t.u.
28. Heat loss in circulating water, 67,200,000 B.t.u.
29. Steam pressure at throttle, 225 lb. gage; superheat at throttle 150 deg. F.; steam per hour, 64,000 lb.; B.t.u. in steam per hour, 81,344,000.
30. One generator on line, 5,000 kw. generated.
31. Excitation, 32 kw., 109,280 B.t.u.
32. Turbine exhaust, 64,000 lb., 68,608,000 B.t.u.
33. Radiation and bearing loss, 200,000 B.t.u.
34. Generator loss, 1,024,500 B.t.u.
35. Induced draft fans, 60 hp., 152,820 B.t.u.
36. Condensing equipment, 127 hp., 323,470 B.t.u.
37. Economizer pump, 5 hp., 12,735 B.t.u.
38. Net output, 4,825 kw., 16,477,375 B.t.u.
39. 805,100 B.t.u.
40. Condensate temperature, 90 deg. F., 3,712,000 B.t.u.
41. Water to distillate tank, 3,330 lb.
42. Loss in sludge, 375 lb., 66,750 B.t.u.

10,000-Kw. Unit

Boiler surface	8,900 sq.ft.
Economizer surface	3,648 sq.ft.
Over-all efficiency	81 per cent
B.t.u. per kw.-hr. generated	17,060 B.t.u.
Auxiliary power	682 B.t.u.
B.t.u. per kw.-hr. sent out	17,742 B.t.u.
Operating efficiency	90
Operating B.t.u. per kw.-hr.	19,713 B.t.u.
Steam pressure at throttle	240 lb. abs.
Steam temperature, throttle	547.4 deg. F.
Steam superheat, throttle	150 deg. F.
Total heat in steam throttle	1,286 B.t.u.
Water rate without extraction	11.6 lb. per kw.-hr.
Auxiliary power: (Electric) Condensing Equipment	160 kw.
Induced draft fans	80 kw.
Fuel oil handling	8 kw.
Feed and service pumps	130 kw.
Miscellaneous and lighting	10 kw.
Total	338 kw.

Commercial Activities and Public Relations

Potential Complaints Reduced 81 per Cent

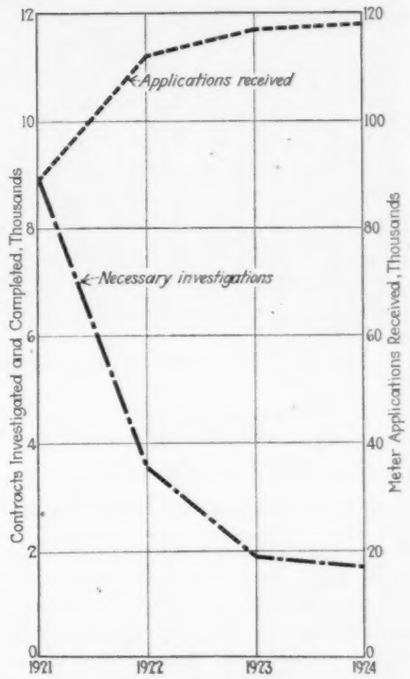
Clearing House for Investigation of Delayed Service Anticipates and Prevents Possible Dissatisfaction of Customers—Waste Effort Reduced and Good Will Increased

ELIMINATION of potential complaints by anticipating and removing the cause before the customer became aware of its existence has materially helped the Commonwealth Edison Company to improve customer relations during the past four years. One of the most common causes for dissatisfaction on the part of a customer is delay in getting his service connected after the wiring has been done, and the company has set up a system of inspection which in a large measure has done away with this kind of complaint.

A. C. Dickson, a representative of the Commonwealth Edison Company's contract department, serves as contact man for electrical contractors and operates a clearing house of information among the contract, inspection and other company departments on matters affecting the connection of customers' service. This is known as the investigation bureau. The greater part of the work of this department is to make investigations of delayed service connections, and the methods used and the changes in practice based on the records of investigations have resulted in a reduction during the past four years of 81 per cent in the number of investigations. The specific activities of the department, together with their effect upon the number of contracts investigated, are shown in the accompanying table. It should be noted that this decrease of 81 per cent in the number of contracts requiring investigation has been accomplished during a period in which the number of contracts signed has increased by 134 per cent.

Liaison Between Inspection Bureau and Contractor

A frequent complaint of contractors is that the inspection bureaus of utilities are slow in making inspections after changes in wiring have been completed. A frequent complaint of utility inspectors is that the contractors are slow in bringing jobs to final completion and are prone to ask for inspection when the work cannot possibly be approved. The customer is generally an innocent onlooker and frequently the worst sufferer from such a situation. The establishment by the Commonwealth Edison Company of a contact man for the contractors has automatically centered such complaints of contractors at one point. Contractors who deal with the same man on every job are inclined to be more considerate, and the company's representative, on the other hand, is in better position to judge whether the contractors are giving the company fair consideration.



HOW INVESTIGATION DEPARTMENT HAS REDUCED DELAYS

When the investigation bureau receives a request for information from a contractor, customer or company department, the records of the application bureau are consulted for the reports of the company's inspector up to the date when the request is made. An abstract of these data is kept by the investigation bureau, a typical record being shown in the accompanying illustration. From these data sheets the investigation department is able to fix responsibility for any delays that may exist and to notify the contractor, the customer or the particular department concerned as to just what conditions exist and what must be done to get service to the customer. If there have been any undue delays, they show up on the data sheets. For example: If a certain contractor gets into the habit of asking for final inspection before the fixtures are hung, the investigation bureau can teach this contractor not to expect or lead customers to expect the meter to be connected before the fixtures are hung or other necessary work completed. On the other hand,

63 REPORT TO APPLICATION BUREAU—INSPECTION BUREAU

OVERDUE GIVEN	RECALL GIVEN

ADDRESS	DATE	SCHEDULE	ORDER NO.
7352 No. Seeley Avenue,	7-16	A	22392

REPORT	INSPECTOR	ADVANCE DATE
13-14 ordered 7/17. Building under Construction	Herman	7/27

1 WIRING NOT STARTED	10 SERVICE DROP FROM ..... FT.	19 ..... FUSES	28 CHANGE METER LOOPS TO THREE WIRE	37 FIXTURES
2 POLARIZE WIRING	11 SER. LOC. REQ.	20 SOLID NEUTRAL	29 CHANGE METER LOOPS TO TWO WIRE	38 FIXTURES NOT ALL INSTALLED
3 NO WIRES IN CONDUIT	12 EXTEND SERVICE OUTLET TO	21 PROVIDE STANDARD GROUND	30 ..... PRESSURE WIRE	39 MOTORS
4 METER FITTING WIRED WRONG	13 LINE EXTENSION ORD	22 GROUND IMPROPERLY INSTALLED	31 WIRE ADDITIONAL TO METER	40 MOTORS NOT ALL INSTALLED
5 PORCH STRAPS REQUIRED	14 CAPACITY MEM. F'W'D.	23 ..... METER CLEARANCE	32 WIRE FOR SEPARATE METER	41 VACANT
6 PORCH STRAPS NOT APPROVED	15 SERVICE DROP ORD	24 NEW TYPE METER FITTINGS	33 LARGER METER BOARD	42 LOCKED AT .....
7 TELEPHONE CLEARANCE	16 SERVICE SWITCH	25 INSTALL METER FITTINGS	34 METER BOARD INSECURE	43 HOLD SERVICE FOR CITY
8 RISER NOT APPROVED	17 CHANGE SERVICE TO THREE WIRE	26 NO END WALL	35 METER LOCATION NOT APPROVED	44 SPECIAL CITY PERMIT FOR .....
9 INTERMEDIATE SUPPORT REQUIRED	18 CHANGE SERVICE TO TWO WIRE	27 BOLT END WA...	36 MAKE WIRING STANDARD & SECURE CITY APPROVAL	45 CITY APPROVAL

FORM I 149 COMMONWEALTH EDISON CO.

FORM OF REPORT TO APPLICATION BUREAU BY INSPECTION BUREAU

MEMORANDUM OF INVESTIGATION

Date.....1925

Residence..... Order.....

Name..... Floor.....

Date	Department	Service Ordered	Service Installed	City Inspection Received	Ordered On	Findings
July 14	Appliance	.....	.....	.....	.....	Received
July 15	Appliance	.....	.....	.....	.....	Forwarded
July 16	Inspection	.....	.....	.....	.....	13-14 bldg. under construction
.....	.....	.....	.....	.....	.....	Advanced 7/27
July 27	Inspection	.....	.....	.....	.....	13-14 bldg. under construction
Aug. 14	Street	.....	.....	.....	.....	Do No. 62,024 (line extension) will be O.K. 8/25
Aug. 17	Inspection	8/18	.....	.....	.....	13-14 Ordered 7/16
Aug. 19	Engineering	.....	.....	.....	.....	Line extension necessary
Aug. 26	Inspection	.....	.....	.....	.....	13-14. Three beyond 16
Sept. 10	Investigation	.....	.....	.....	.....	Overhead will forward service orders today and admit delay thereon
Sept. 11	Investigation	.....	.....	.....	.....	Service drop will be installed
.....	.....	.....	.....	.....	.....	9/12 per Street Department
Sept. 12	Street	.....	9/12	.....	.....	.....
Sept. 28	Inspection	.....	.....	.....	.....	37/45. Advanced 10/7
Oct. 7	Inspection	.....	.....	.....	.....	37/45. Advanced 10/16
Oct. 12	.....	.....	.....	10/12	.....	On wiring only
Oct. 19	Inspection	.....	.....	.....	.....	37/45. Advanced 10/28
Oct. 29	.....	.....	.....	10/29	.....	On fixtures
Oct. 29	Inspection	.....	.....	.....	10/29	.....

Contractor..... Phone.....

ACD

if the investigation bureau's records show that there has been undue delay in making an inspection, this matter can be called to the attention of the department concerned and assurance received for better future performance.

This bureau serves also as a means of speeding up inspections that might otherwise be held over. If an inspector finds work incomplete, he advances the date of inspection the customary ten days. If the contractor's work is completed within two days, he can notify the investigation bureau that all work is done and reinspection will then be made within forty-eight hours. In emergency cases, such as death or illness, the company endeavors to give immediate service by closing loops within twenty-four hours, provided the city inspection has been made and no defects exist. The inspection bureau also keeps a man in the city's electric bureau to trace city permits. Direct phone communication between this man and the investigation bureau permits prompt action on requests for information on permits.

Many of the company's customers have expressed appreciation of this service. One estimate places the value of this department at a saving of four hours' time per week for every contractor, and there are more than 800 contractors in Chicago.

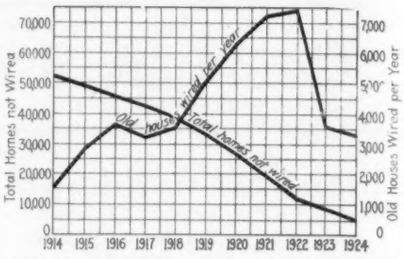
FOUR-YEAR RECORD OF INVESTIGATION DEPARTMENT, COMMONWEALTH EDISON COMPANY

	1924	1923	1922	1921
Meter applications received	118,005	117,456	112,221	88,245
Meter applications received, per cent	134	132	127	100
Contracts investigated and completed*	1,689	1,836	3,499	8,849
Contracts investigated and completed, per cent	19	21	40	100
Telephone inquiries from contractors	2,964	3,774	5,543	4,737
Customers calling in office	398	397	531	406
Contractors calling in office	152	162	175	385
Inquiries received by mail	324	536	721	1,543
Contractors and customers called back	1,651	972	2,543	3,589
Contracts holding December 31	30	46	46	81
Contractors recommended for house wiring jobs	801	736	534	0

*These contracts were investigated because the customer believed there was a delay in turning on service Had no investigation been made, a complaint would have followed.

Effect of Ten Years' House-Wiring Activity

THE progress made by the Minneapolis division of the Northern States Power Company in the wiring of old houses during the past ten years indicates the possibility of a close approach to the saturation point in wired homes. In 1914 there were 52,000 unwired houses in Minneapolis, but by the end of 1924 less than 6,000 houses remained unwired. More than 50,000 houses have been wired during this past decade, displacing more than a million gas lights and bringing this company upward of $1,200,000 additional annual revenue.



EFFECT OF PERSISTENT HOUSE-WIRING ACTIVITY IN MINNEAPOLIS

The effect of persistent effort on the wiring of old houses is seen in the decreasing proportion of old houses wired to the total new lighting customers. In 1922 old houses wired accounted for 63 per cent of the total new lighting customers, whereas in 1924 only 47 per cent of new lighting customers were represented by old houses wired. The chart of old houses wired per year and total houses remaining unwired shows clearly the effect of the company's house-wiring activity.

The success of this program in Minneapolis has encouraged the Northern States Power Company to extend it in other divisions. During a forty-five-day campaign in Eau Claire, Wis., 134 old houses were wired, resulting in an increased revenue of $3,216. A fixed schedule of wiring prices together with easy terms of payment simplified the problem and encouraged prompt action.

WISCONSIN-MINNESOTA LIGHT & POWER CO.

BYLLESBY ENGINEERING & MANAGEMENT CORPORATION

CHICAGO—NEW YORK

EAU CLAIRE WISCONSIN

To the Lady in This House
Who Knows a Real Bargain
When She Sees One:

I've never met a woman yet who didn't take advantage of a real honest to goodness bargain when she saw one, and for this reason I m sending You this Money Saving letter

We've just completed arrangements for a big Housewiring Sale, during which, if you wire your home, you certainly can save money!

Our special offer is simply this:

For the next 30 days you can wire your home at the following ridiculously low prices

Four room house	$44.00
Five room house	49.00
Six room house	52.70
Seven room house	71.00

And all you have to pay is $5.00 down and the balance in eleven months. Just think of being able to obtain one of the greatest conveniences now and paying for it as you enjoy it.

This offer is, of course, for 30 days only and I'd suggest that you call 2500 NOW so that we can give you a Free estimate. Anyhow, I'll look for a call from you

Expectantly yours,

Commercial Manager

Call
2500

FIXED SCHEDULE OF WIRING PRICES AND EASY TERMS OF PAYMENT HELP HOUSE-WIRING PROGRAM

1,350 Ornamental Standards for Suburb

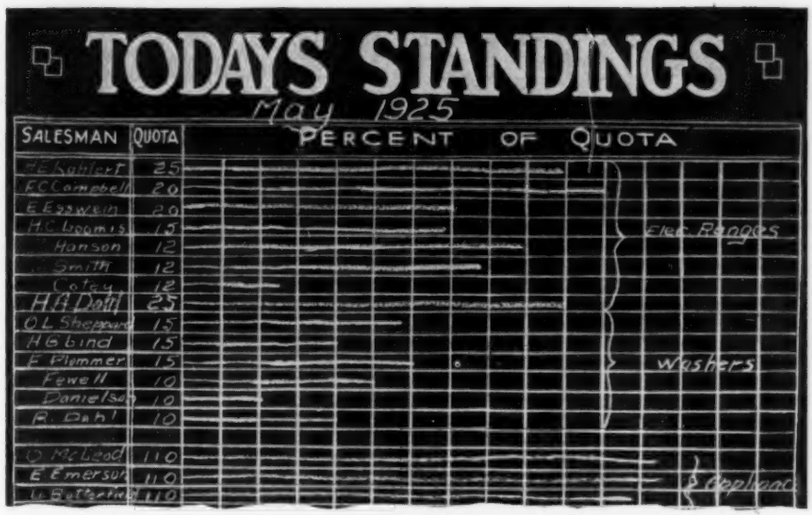
WILMETTE, one of the several attractive north shore suburbs of Chicago, has been completely equipped with modern ornamental street lighting. In the business and boulevard sections are 180 12½-ft. ornamental Arcadian cast-iron posts, each topped by an octagonal Colonial lantern containing a 250-cp. lamp. In the residential sections are 1,171 10½-ft. standards of similar design equipped with 100-cp. lamps. The standards are approximately 130 ft. apart, staggered. They are placed on diagonally opposite corners of street intersections and at the end of stub-end streets, where a red light is provided in the base as a warning to traffic. There are fifty-nine of these warning lights, in addition to six pedestal warning signals at dangerous curves and at the ends of streets.

For a suburban village, it was considered inadvisable to install brighter lamps with taller posts that would cast light into the second-story windows of residences and would also project into the foliage. Two parabolic reflectors in the lanterns, above and below the lamp, redirect the rays onto the horizontal plane and also eliminate dark circles around the posts. Clear synite glass, which has sufficient diffusing effect to diminish glare without absorbing too much light, is used in the eight panels of each lantern.

Underground circuits are used throughout, conduit being employed in the business districts and steel-armored cable being laid in the parkways elsewhere. To avoid tearing up pavements where circuits had to be laid, a 2-in. galvanized-iron pipe was forced through the earth by a pipe-pushing jack and the cable threaded into the pipe. Twenty-four hundred feet of pipe was installed in this manner, as much as 48 ft. being pushed at one time without damage or loss of pipe.

No high-voltage circuits enter the posts, as they terminate in group transformers with group secondaries. Since the completion of the system six standards have been demolished by motorists, but in each case the automatic series-film cutout functioned to maintain continuity of service in the remainder of the circuit.

Including thirty large group transformers, 200 kw.-in. regulators and the substation equipment, the entire installation cost $305,000. Fred A. Gurdes was electrical and supervising engineer for Wilmette and A. M. Rykoff was the contractor.



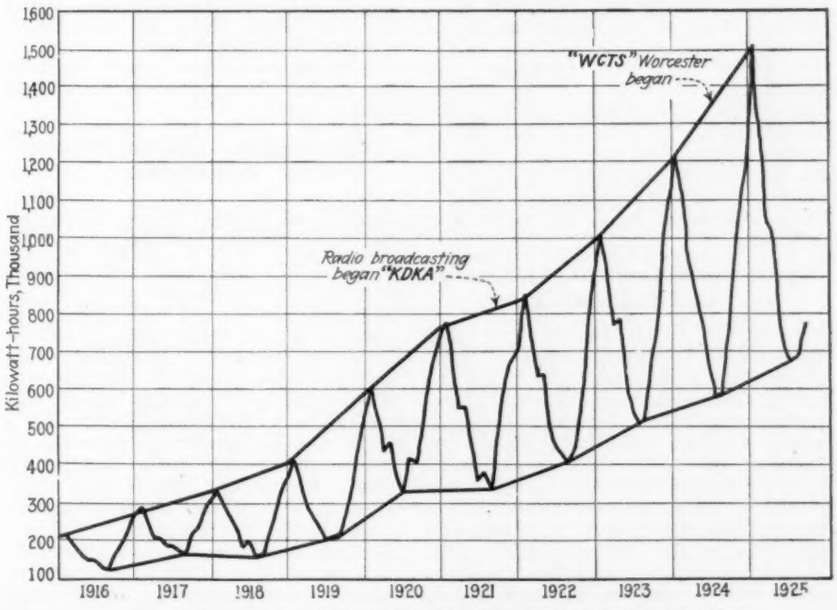
SALESMEN'S QUOTA BOARD USED BY THE NORTHERN STATES POWER COMPANY

Residential Service Gains Fastest in Winter

THE use of electricity in residences on the lines of the Worcester (Mass.) Electric Light Company has increased much faster of late during the winter, according to the accompanying diagram, than in the summer. This acceleration is attributed to the larger use of appliances and to long-hour burning of lamps in radio reception. It is interesting to note that the curve of winter peaks shows a sharp upward trend with the establishing of broadcasting in 1921, followed by a station in 1924 at Worcester itself.

Use of Quota Board to Stimulate Sales

FRIENDLY competition among salesmen has always been one of the best means of stimulating sales effort, and various devices have been used by central-station sales managers to encourage this spirit. H. A. Dahl, manager of merchandise sales for the Minneapolis division of the Northern States Power Company, uses the score board shown here to indicate the progress of each salesman toward his monthly sales quota, which is placed opposite his name on the first of the month. The length of the horizontal line, which is extended each day according to the volume of sales, shows at a glance the percentage of the quota reached and the salesman's standing.



RADIO FANS AND APPLIANCE USERS INCREASE RESIDENCE SALES

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

Zweribach Station. — K. KOBLER.— This hydraulic power station holds the German record for high-head installations. Located in the Black Forest region, it utilizes in a single fall a hydraulic head of 490 m. There are three 780-hp. Pelton wheels, each consuming 150 liters of water per second. They are directly connected to 1,000-r.p.m., 800-kva. totally inclosed three-phase generators. On the opposite end of the turbine shaft a nine-stage centrifugal water pump can be connected with a clutch to the generator via the Pelton runner. During periods of water shortage or small power demand the plant can operate as a pumping station, driving its generators as motors, with current from tied-in stations. In that case 130 liters per second can be pumped by each set to a reservoir 500 m. above the power house.—*Elektrotechnische Zeitschrift*, Oct. 22, 1925.

Intermediate Superheating. — KURT THIELSCH.—The highly economic multistage turbine often requires the provision of several cylinders and receives steam with a relatively high degree of saturation in the low-pressure chamber. As a result not only is the aggregate heat utilization affected, but the blades working in this part of the machine rapidly wear out. Consequently the process of intermediate superheating, by which these drawbacks can, it is hoped, be largely removed, is receiving increased attention. The present paper discusses the advantages and methods of securing favorable conditions. If the saturation content in the last stage of a modern turbine is taken as about 12 per cent, the stage efficiency will be only about 7.5 per cent, while with superheated steam it may rise to 85 per cent. Accompanying charts show that the gain in theoretical thermal efficiency of a turbine built for live steam at 35 atmospheres and 400 deg. C. can, under the most favorable conditions, be brought up to about 37.5 per cent by intermediate superheating to the initial temperature. In practice the complications and inevitable losses restrict the amount of reheating to a lower value.—*Electrician (England)*, Nov. 6, 1925, abstracted from *A. E. G. Mitteilungen.*

Generation, Control, Switching and Protection

Control of Power Factor for Tied-in Stations.—J. KRISTEN.—Parallel operation of power stations is of great and growing economic importance. It presents many new problems, some of which have not been fully solved. If two stations are intended to co-operate in their respective power supplies and if their voltage and the impedance of the tie line are given, a satisfactory parallel operation will only be possible if the incoming energy arrives at a power factor equal to the local power factor of the assisted station. If this is not the case, the station must supply an additional wattless energy, which may have to be inductive or capacitive, in order to utilize the received energy. As the load varies the amount of wattless energy has to be varied accordingly. Such a regulation may be obtained by transformers with taps, changing these taps under full load, which requires a special switching arrangement. The author claims that ideal control of the power factor can be accomplished by induction voltage regulators, which can be so dimensioned and operated that absolutely perfect regulation is obtained. A Swiss concern has developed recently a fully automatic device of this kind, consisting of a Thury relay, a small adjusting and a large main induction regulator. This apparatus rectifies, so to speak, the incoming energy in such a way that its power factor is always identical with the local power factor, regardless of voltage, load or direction of flow. The extensive theoretical explanations in this paper are made by very transparent vector analysis.—*Bulletin de l'Association Suisse des Electriciens*, No. 10, 1925, and *Bulletin Oerlikon*, September, 1925.

Changing Transformer Ratio Without Interrupting the Load.—M. H. BATES.—In general, this scheme of connections uses a three-phase transformer, or three single-phase units combined with a regulating auto transformer, having on either the high voltage or low-voltage side two equal parallel windings. In each winding there are three ratio adjusters, simultaneously operated. Each half winding is capable of carrying full kva. while the ratio adjuster of the other half is being changed. The scheme also employs a circuit breaker in each half, and in addition to that properly timed mechanical gears, etc., to operate each device in the desired sequence. Component parts for this method of changing the ratio, most of them being standard equipment, are described and circuit diagrams for other conditions are given.—*Journal A. I. E. E.*, November, 1925.

Transmission, Substations and Distribution

High-Voltage Cables. — P. DUNSHEATH.—This is an abstract of a paper read before the I. E. E. dealing with problems of theoretical and practical interest. It commences with the fundamental phenomena of dielectric absorption and the experimental determination of absorption coefficients under different conditions. A discussion on the connection between alternating-current and direct-current characteristics is supported by experimental results, as shown by a chart. The alternating-current losses are dealt with as I^2R losses in place of the usual hysteresis conception. Among the data are curves showing variation of dielectric loss of impregnated-paper cable with frequency and temperature and the effect of current on the power-factor voltage curve. It is pointed out that the breakdown strength of cable is not a constant characteristic; that there is no such thing as a certain stress at which cable breaks down, the effect of time being all-important. A large number of curves have been obtained of different lengths of cable, showing in all cases that the higher the voltage the shorter the period during which the cable will hold it. From these results it is possible to use short-time tests to obtain information on long-time performance. The presentation of this paper evoked considerable discussion, the substance of which is reported in another part of the same issue. — *Electrician (England)*, Nov. 13, 1925.

Units, Measurements and Instruments

Dielectric Absorption in Fibrous Insulating Materials.—R. E. MARBURY and E. R. LE GHAIT.—To account for 60-cycle losses in a dielectric on the basis of absorption, a means was devised of measuring residual voltages over time intervals of a small fraction of a cycle. A diagram of connections of the instrument is given in the article. The device has been, among other things, used to find the effect of treatment for removing moisture. Curves showing the result are given in the paper, and the general subject of absorption is discussed in the light of theory and experiment.—*Electric Journal*, November, 1925.

Cathode-Ray Oscillograph. — A. B. WOOD.—The paper draws attention to three commercial forms of cathode-ray oscillograph which may be employed in the study of very high-frequency alternating or impulsive electrical phenomena. The equations of motion of a stream of cathode rays in electrostatic and magnetic fields are first reviewed, and by taking into account the experimentally determined values of e, e/m and m they are put into forms suitable for numerical application in oscillograph design. The question of photographic sensitivity is discussed, and calculations are made of the relative photographic effects produced by rays of different velocities. It is shown that ordinary plates or films are, in general, unsuitable for recording purposes by means of low-velocity cathode rays. A plate very rich in silver bromide in proportion to the gelatine is recommended. The principal features of the three commercial forms of oscillograph, previously alluded to, are described and shown by diagrams. Finally, a few of the numerous applications are indicated and records are reproduced. These include wave forms at frequencies up to 10,000 cycles per second, secondary voltage fluctuations in a spark-coil at make and break, and a train of damped oscillations at 150×10^6 cycles per second.—*Journal I. E. E. (England)*, November, 1925.

Illumination

Night Lighting for Outdoor Sports. —O. F. HAAS and H. M. SHARP.—Suggestions are given as to the size, arrangement and spacing of suitable lighting units for standard courts

(tennis, hockey, volley ball, roque and croquet, horseshoe pitching, bowling on the green, race tracks and swimming pools) and for playgrounds and large areas (bathing beaches, football, indoor baseball and trap shooting).—*Bulletin* 51, *Engineering Department, National Lamp Works.*

Electrical Advertising: Its Forms, Characteristics and Design.—C. A. ATHERTON.—This bulletin is devoted to a discussion, first, of the principal forms of electrical advertising and their suitability to various uses; second, of the general characteristics that may be utilized in making electrical advertising effective, and, third, of the fundamentals of design that give a sign legibility, smoothness and proper brightness.—*Bulletin* 50, *Engineering Department, National Lamp Works.*

Motors and Control

Output of Totally Inclosed Electric Motors for Specified Temperature Rises.—FREDERICK MURGATROYD.—On the basis of theoretical and experimental considerations the author has derived a curve expressing the output for various lengths of time which will give the same heating as a continuous six-hour run. For the curve an equation has been derived,

$$T \times P^{2.675} = 1.362 \times 10^6,$$

where T is the duration of the run in hours and P is the brake-horsepower as a percentage of the brake horsepower for a six-hour run to give the specified temperature rise. The author believes that this law, which is definitely applicable to the particular motor on which the test was made, is equally applicable to all totally inclosed machines having a temperature rise limit of 100 deg. F. and may be taken as approximate for totally inclosed machines designed for any other rise.—*Engineering* (*England*), Nov. 6, 1925.

Two-Speed Cascade Induction Motor.—A. H. M. ARNOLD.—The general conditions of two motors in direct and differential cascade are considered. It is pointed out that the set may under certain conditions run at a speed near the synchronous speed of the primary machine while still connected in cascade. The discussion makes use of circle and mmf. vector diagrams and gives the results of an oscillographic study. Much of the paper deals particularly with the Hunt two-speed motor.—*Journal I. E. E.* (*England*) November, 1925.

Heat Applications and Material Handling

Large Electrically Operated Excavator.—The machine has been put into operation in Australia for open-cut mining in a coal field. The length of the jib is 90 ft., the bucket capacity 10 cu.yd. and the total weight of the shovel 418 tons. A five-unit motor-generator set converts the 6,600-volt, 50-cycle, three-phase current into low-voltage direct current. The Ward Leonard system of control is used on the motors for the three motions of the machine. The article under review gives details regarding the mechanical and electrical features and the mode of operation, with views and drawings.—*Engineer* (*England*), Nov. 6 and 13, 1925.

Electrophysics, Electrochemistry and Batteries

Commercial Status of Nitrogen Fixation.—J. M. BRAHAM.—The direct combination of nitrogen with hydrogen under conditions of relatively high temperature (450 deg. to 600 deg. C.) and very high pressure (1,500 lb. to 15,000 lb. per square inch) in the presence of a catalyst is the most recently developed and by far the most important fixation method. The energy required is approximately only 4,000 kw.-hr. per metric ton of nitrogen fixed. This is the fundamental feature of the synthetic ammonia processes independently developed in different countries and now generally referred to as different processes, such as the Haber, the Casale, the Claude and others. The principal item of cost is the production of hydrogen in a sufficiently pure form. Several methods are in use for this purpose. A new one now being developed at Niagara Falls consists in producing elemental phosphorus in an electric furnace from a charge consisting of phosphate rock, sand and coke and then treating the phosphorus with steam in the presence of a catalyst, thereby producing hydrogen and phosphoric acid. The latter will be used in the manufacture of ammonium phosphate. One synthetic ammonia plant in Germany has a capacity equivalent to 1,280,000 tons of Chilean nitrate, or five times the capacity of the cyanamide plant at Muscle Shoals. Much more combined nitrogen is being obtained from the air than from Chilian nitrate or byproduct ammonia; the estimated percentages are 44, 30 and 26, respectively. Tables are included showing relative efficiencies of various processes.—*Chemical and Metallurgical Engineering*, November, 1925.

Traction

Electric Yard Locomotive.—W. LÜTHI.—Although it is generally conceded that electric traction on main roads has great advantages over steam propulsion, little effort has so far been made toward an economic adaptation of electric drive for strictly yard locomotive service, chiefly because it was assumed that this field was covered better by steam engines. On several of its main railroad stations the Swiss government has now in regular service a specially designed electric yard engine, which, after two years of the most diversified service, has disproved this assumption. The locomotives have one 690-hp. (one-hour rating), single-phase, $16\frac{2}{3}$-cycle motor, which, over a single reduction gear of 1:3.7, operates a jack shaft from which a rod drive actuates three running axles. A 500-kva. transformer reduces the trolley voltage from 15,000 to a motor voltage adjustable in thirteen steps between 110 volts and 610 volts. In addition, a 1,000-volt tap at 200 kva. output is provided on the transformer for train heating. The engine weighs complete 49 tons. Recorders installed in the cab of the engine indicate an average of 365 stops and starts per day, or about twenty-four per hour. In emergencies these locomotives have been pressed into freight service for long hauls, developing up to 18 m.p.h.—*Brown, Boveri Mitteilungen*, November, 1925.

Great Northern Electrification.—E. MARSHALL.—Announcement has been made by the Great Northern of its intention to electrify 24 miles of main line on the west slope of the Cascade Mountains from Skykomish to Cascade Tunnel, Washington. The three-phase system through the tunnel, constructed in 1909, is to be retired; the new electrification is to use a single-phase supply at 11,000 volts. On the locomotives a 1,500-kw. motor-generator set will make the conversion to direct current, supplied at 600 volts, to four 500-hp. motors, with generator voltage control for acceleration. Four such cabs are to constitute a locomotive, except that for the present only two cabs will have motor-generator sets. The trolley system will consist of a simple catenary with inclined catenary on the curves, all of non-ferrous metal of conductivity equivalent to 300,000-circ.mil copper, carried on wooden poles, except in the tunnels. Operation is to commence June 1, 1926. The paper gives further details regarding the equipment, power supply, profile of the line and advantages anticipated.—*Railway Age*, Nov. 14, 1925.

Telegraphy, Telephony, Radio and Signals

Effect of the Solar Eclipse of January 24, 1925, on Radio Reception.—GREENLEAF W. PICKARD.—Numerous observations by listeners at various points, receiving signals from several broadcasting stations, show peculiar results during the period of the eclipse, especially at totality. In some cases the strength increased, in others it decreased. This is shown graphically in the paper. The author endeavors to account for these apparently discordant results on the basis of the Eccles-Larmor hypothesis. He assumes that the reduced solar radiation in the shadow zone decreases the ionization in the upper atmosphere and therefore locally lowers the wave sheet. The resulting "dent" changes the interference between the direct wave and that coming by way of the upper atmosphere. The effect at the receiving station will thus depend on the relative positions of the stations involved and the "dent."—*Proceedings of I. R. E.*, October, 1925.

A "Detection Coefficient."—LEO BROADWOOD.—In a communication the writer calls attention to the coincident discovery by Dowling and Higgins (published in the *Electrician* and recently noted in the Digest) and by F. M. Colebrooke (published in *Experimental Wireless* and the *Wireless Engineer* for November) of the exponential character of the grid-current-grid-voltage curve. The experimental curves in the two papers are similar and the conclusions are substantially the same, but the mathematical treatment differs.—*Electrician* (*England*), Nov. 20, 1925.

Scientific & Industrial Research

[When investigations which have been completed are, in the opinion of the editors, of wide enough interest to the field we serve, details thereof will be presented in other parts of this paper. Contemplated research or that which appears to have limited appeal will be only briefly reported in this section, but details may be had by communicating with the investigator or institution named in the report. Readers are referred to the department "Digest of Electrical Literature" for investigations reported in other journals. The news and engineering sections should also be followed for research reported before technical societies.]

Research Completed

Altitude, Measurement of, Electrically

A new instrument which measures altitude electrically, and about eight times as accurately as the ordinary barometer, to a height of at least one mile, has been constructed by the French physicists Huguenard, Magnan and Planiol. The apparatus is based on the fact that a heated object cools off much more quickly in dense air than in very thin air or near-vacuum in which there is very little matter to conduct or convey the heat away. The density of air depends on the altitude, so that an instrument that will measure air density will also give a measure of the altitude.—*Science Service, Washington, D. C.*

Circuit Breaker, High-Speed

One of the outstanding developments in the field of low-voltage direct current is the application of the high-speed breaker which has up to this time been confined to protection of higher-voltage equipment. The breaker-closing mechanism is operated by a motor, thus requiring a lower value of operating current than would a solenoid-operated breaker having the same ampere capacity. A holding coil and "bucking-bar" arrangement is substituted for the latch ordinarily used on low-voltage direct-current breakers.—*Electrical Apparatus Committee, N. E. L. A.*

Induction Regulator, Step-by-Step-Type, for Synchronous Converters

This device is an ordinary three-phase induction regulator mechanically connected to a tap changer and driven by the same motor. An extended high-tension winding with numerous taps is provided on the high-tension transformer, the range of the induction regulator corresponding to the voltage between successive taps. The regulator may be transferred from tap to tap, thus making it possible to vary uniformly the transformer secondary voltage supplied to the converter.—*Electrical Apparatus Committee, N. E. L. A.*

Inductance Coils, Radio-Frequency

During the past year the bureau has carried on an investigation of the radio-frequency resistance and other properties of various types of coils suitable for use in radio receiving sets at broadcast frequencies. Typical coils were adjusted to have the same inductance at a low frequency (1 kilocycle). Measurements were made of the resistance and inductance at frequencies covering the broadcast band (500 to 1,500 kilocycles). The coils included several types made up of solid and litz wire, single and multiple-layer coils of several types of winding, single-layer coils of various sizes of wire and single-layer coils covered with different kinds of insulating binder.—*Bureau of Standards, Washington, D. C.*

Piezo Crystal, Use of, in Radio, for Frequency Control

A piezo crystal, ground to a certain size and form and placed in a specially designed transmitting circuit, automatically holds an assigned wave length. The size and the shape of the crystal govern the frequency of the transmitter and hold it constant. It is expected that one of the most frequent causes of program signal distortion, due to stations deviating from their assigned wave length and so interfering with each other, will be eliminated by a general use of piezo crystals.—*Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.*

Reactor with Braided Asbestos Insulation

A fireproof current-limiting insulator reactor of standard concrete construction has been developed, with braided asbestos insulation. The insulation will prevent the possibility of failure on account of foreign material which might be drawn into contact with the conductors by the strong magnetic pull when the reactor is subject to high values of current due to short-circuit conditions.—*General Electric Company, Schenectady, N. Y.*

Rubber, Electrodeposition of

Rubber particles in natural latex (ammoniated) and in artificial rubber dispersions in water are negatively charged, and in an electric field they will move to the anode. This effect had been used previously to coagulate raw rubber by electrical means. It has now been found possible to admix latex or rubber-in-water dispersions with sulphur, pigments and accelerators and by electrolysis to deposit rubber compounds upon both metals and other materials in the form of coherent, homogeneous layers of a considerable range of thickness. These deposits can be vulcanized according to any desired vulcanization factor, and the process can also be used to impregnate fabrics.—*S. E. Sheppard and L. W. Eberlin, Eastman Kodak Company, Rochester, N. Y.*. [This process opens a new field for the use of electric current and will probably create new applications for rubber, as, for example, impregnation of various fabrics and sheet insulation.—EDITOR.]

In Progress or Purposed

Ceramic Glazes, Abrasive Hardness of

A systematic study of forty-nine experimental glazes has been started. Observations concerning the following factors have been made: (a) Variations in silica and alumina, (b) variations in glaze thickness, and (c) temperature at which the glazes were fired. The data so far obtained indicate that (a) hardness varies in direct proportion to SiO_2, no other factor being variable; (b) as Al_2O_3 increases uniformly from 6 to 10 per cent the hardness remains uniform, from 10 to 12 per cent Al_2O_3 it is reduced materially, and it again increases from 12 to 16 per cent Al_2O_3; (c) thickness apparently affects hardness appreciably, there being a definite maximum thickness-hardness relation; (d) variations in firing within one or two cones did not appear to affect hardness. However, hardness of the high alkali glazes increased considerably upon firing them to cone 9 instead of cone 5.—*Bureau of Standards, Washington, D. C.*

Color Terminology

The committee on color terminology of the Optical Society of America has prepared and widely circulated a questionnaire on color terminology. A large number of replies have been received, together with many interesting letters and suggestions. These replies have been classified and presented to the society.—*F. K. Richtmyer, Cornell University, Ithaca, N. Y.*

Power Transmission Systems, Connections Between

An investigation of the connections existing and proposed on about thirty large systems is under way. For purpose of analysis these systems will be grouped into a few classes in which reliability will be contrasted with cost. Reliability will include reserve or spare equipment, operating flexibility and the like. Cost will include investment as well as maintenance.—*A. H. Kehoe, United Electric Light & Power Company, New York City.*

Rubber, Aging Tests on

Within the last year the bureau has started an extensive investigation of the aging of rubber, with three objects in view; First, to determine the cause of the deterioration of rubber; second, to find means to prevent it; third, to devise laboratory tests by which the life of a rubber article can be predicted with more accuracy than is at present possible. The work to date has been confined to four different rubber compounds ranging from "pure gum" to a highly compounded stock containing reclaimed rubber.—*Bureau of Standards, Washington, D. C.*

Transmission System, Artificial

Extensive tests are being carried on on an artificial transmission system equipped with synchronous generating and receiving apparatus, synchronous condensers, voltage regulators, transmission lines adjustable as to the length, characteristics, etc. With this equipment it has been possible to set up almost any combination of conditions that might obtain in a practical installation and to vary the characteristics of individual pieces of apparatus in any way that might show promise of interesting results.—*R. E. Doherty and H. H. Dewey*, General Electric Company, Schenectady, N. Y. (quoted from an A. I. E. E. paper).

Suggestions for Research

Choke Coils Shunted by Resistances

Some European engineers recommend placing choke coils on transmission lines, a certain distance apart, each coil being shunted by a fairly high non-inductive resistance. A traveling wave is attenuated at each such device, its front becomes less steep, and some of its energy is absorbed in the resistance. Such electrical "baffles" should be effective against surges caused by switching as well as against traveling waves due to a stroke of lightning. It is desired to establish the value of such protection by experiments on actual lines and in the laboratory; also to develop mathematical formulas for the best values of the resistance and the inductance.

Oil, High-Tension, Sludging of

Some companies have reported a great deal of maintenance expense due to sludging of transformer oil. Investigations indicate that the deterioration of oil varies considerably with transformers of different manufacturers. The various possible causes, such as the elements entering into the construction of the windings, quality of the oil, operating temperatures, etc., have not definitely been determined, and the subject is of sufficient importance to warrant further study.—*Electrical Apparatus Committee, N. E. L. A.*

Resistance Measurement without Electrical Connection

It is sometimes desirable to be able to measure the resistance of a conductor without making an electrical connection with it. One possible way is to establish a secondary oscillating circuit of which the resistance under test can be made a part. From primary measurements with and without this resistance (at resonance) its value may be computed. For the theory see *Institution of Electrical Engineers* (British) *Journal*, 1925, Vol. 63, page 397. It is desired to work out the details and definite instructions for the use of this method in testing ground connections and in other practical cases.

Steel, Thermomagnetic Analysis of

Thermomagnetic analysis is a sensitive method for the study of the constitution of ferromagnetic metals and alloys, their allotropic modifications and the chemical changes produced in them. In the *Revue de Métallurgie*, 1925, Vol. 22, page 27, P. Nicolau describes a very sensitive differential arrangement by means of which variations in the intensity of magnetization with temperature may be observed with considerable precision. It is desired to apply the apparatus to the needs of steel mills and of treaters and users of various grades of steel and ferromagnetic alloys, to enable them to subject samples to an accurate non-destructive test as to the constitution and its changes.

Welding, Processing of Wire for

As the result of microscopic examination and other tests, it is believed that chemical analysis alone does not guarantee a welding wire to possess all the necessary requirements for a good weld. Definite special processing is required, separate and distinct from that for any other class of wire.—*C. A. McCune, American Chain Company, Bridgeport, Conn.*

News of the Industry

Chesney for President

Nominating Committee of Institute Selects Engineering Head of Pittsfield Works

THE national nominating committee of the American Institute of Electrical Engineers, consisting of fifteen members from various parts of the country, has nominated the following official ticket of candidates for the offices falling vacant August 1, 1926:

For president: Cummings C. Chesney, manager and chief engineer General Electric Company, Pittsfield, Mass.

For vice-presidents: Northeastern District—H. M. Hobart, consulting engineer General Electric Company, Schenectady, N. Y.; New York City District—George L. Knight, mechanical engineer, Brooklyn Edison Company; Great Lakes District—B. G. Jamieson, engineer of inside plant, Commonwealth Edison Company, Chicago; Southwest District—A. E. Bettis, vice-president Kansas City Power & Light Company; Northwest District—H. H. Schoolfield, chief engineer Pacific Power & Light Company, Portland, Ore.

For managers: F. J. Chesterman, chief engineer Bell Telephone Company of Pennsylvania, Philadelphia; H. C. Don Carlos, operating engineer Hydro-Electric Power Commisssion of Ontario, Toronto; I. E. Moultrop, assistant superintendent construction bureau Edison Electric Illuminating Company of Boston.

For treasurer: George A. Hamilton, electrical engineer (retired), Elizabeth, N. J.

These official candidates, together with any independent nominees that may be proposed later in the manner specified by the constitution and by-laws, will be voted upon by the membership at the coming election in the spring of 1926.

MR. CHESNEY'S CAREER

Cummings C. Chesney, official nominee for the office of president, was born in Selinsgrove, Pa., October 28, 1863, and was graduated from the Pennsylvania State College in 1885. After teaching mathematics and chemistry for three years he became associated with William Stanley's laboratory at Great Barrington, Mass., and was one of the original incorporators of the Stanley Electric Manufacturing Company of Pittsfield, Mass., which developed the well-known "S K C" polyphase system (Stanley-Kelly-Chesney). Mr. Chesney was vice-president and chief engineer of the Stanley company from 1904 to 1906, and in the latter year he became chief engineer and manager of the Pittsfield works of the General Electric Company, which had acquired the Stanley company. Mr. Chesney has served as manager and vice-president of the A. I. E. E. and also upon various committees. He is also a member of various other scientific and engineering organizations. The Edison medal was awarded to Mr. Chesney in 1921 "for early developments in alternating-current transmission."

C. C. CHESNEY

National Academy of Sciences to Raise Research Fund

Encouraged, perhaps, by Secretary Hoover's recent indictment of the nation for its lack of interest in research in pure science as distinct from industrial research, the National Academy of Sciences has appealed to a body of prominent public men to join with the leading scientists of the country in an endeavor to secure larger resources for the purpose sought. It is hoped that an annual income of at least two million dollars can be obtained to establish national research professorships and in other ways to co-operate with universities and scientific institutions.

The academy has created a special board of trustees for such funds, which includes Dr. Albert A. Michelson, its president; Gano Dunn, chairman, and Dr. Vernon Kellogg, permanent secretary of the National Research Council; Dr. Robert A. Millikan, Owen D. Young and many other men prominent either in scientific and educational circles or in public life. Mr. Hoover will be chairman.

Congress Will Not Take Up Muscle Shoals Before Recess

The rules committee of the House of Representatives at its first meeting this week discussed the Snell and Madden resolutions providing for the appointment of a joint congressional committee to enter into negotiations for the leasing of the Muscle Shoals properties for a term of fifty years to private operators. No report is likely to be made until after the Christmas recess. Chairman Snell said: "We are determined to utilize these properties. We want to produce nitrates, provide for the national defense and distribute surplus power to the public utilities in the immediate vicinity."

Hearings on Tennessee

Tennessee Hydro-Electric Company and East Tennessee Development Company Are Represented

WHEN Major H. C. Fiske opened the hearings on applications for rights on the Tennessee, Clinch and Powell Rivers at Chattanooga this week it was announced that the Tennessee Electric Power Company and the Knoxville Power & Light Company had withdrawn their applications. As listed in the ELECTRICAL WORLD on November 7 (pages 966 and 967), the first-named of these two companies had made three applications and the second-named six. Their withdrawal left only the Tennessee Hydro-Electric Company, with five applications, and the East Tennessee Development Company, with eleven, to state their case. It developed that the latter company's capital stock was owned in equal shares by the Tennessee Power Company, which is part of the Tennessee Electric Power Company, and the National Power & Light Company, which controls the Knoxville Power & Light. No contending interest was therefore eliminated by the withdrawal.

The Tennessee Hydro-Electric Company was represented by Charles B. Hawley of Washington, D. C., a consulting engineer and vice-president of the company, and the Tennessee Development Company by M. O. Leighton of Washington, D. C., a consulting engineer and vice-president of that company. Asked by Governor Peay of Tennessee, "Where are you doing business now?" Mr. Hawley is reported to have answered: "We intend to get business and then proceed through affiliated companies."

WIDE INTEREST IN HEARINGS

The tremendous amount of latent power in the Tennessee—estimated as high as 4,000,000 hp.—has attracted great attention to the hearing on the part of both state and national officials. The Governor declared that he wanted the power used within the state to the greatest extent possible, though he admitted that the state could not raise the capital to develop it. Senator McKellar of Tennessee, complaining that no report of the survey of the river authorized by Congress and made by Major Fiske has yet been made to Congress, opposes the giving of "power rights of enormous value" to the "electric power trust" for outside use.

As intimated in the ELECTRICAL WORLD last week, Congress may take a hand in the situation and possibly withdraw the Tennessee, along with the Colorado, temporarily from development. The hearings had not been concluded as the ELECTRICAL WORLD went to press, engineers, representatives of the Tennessee government and of the Tennessee Manufacturers' Association and others being heard.

Cincinnati's New Power Station

Imposing Ceremony Marks the Dedication of the Superpower Generating Plant of the Columbia Power Company at Miami Fort, Ohio

THE new fifteen-million-dollar generating station of the Columbia Power Company at Columbia Park (Miami Fort), near the confluence of the Ohio and Big Miami Rivers, was formally dedicated on December 10 with imposing ceremony. A special train from New York brought distinguished financiers and leaders in the electrical industry to Cincinnati for the occasion, and special trains carried members of the Chamber of Commerce and leading citizens of the Miami Valley to the power house.

The 45,000-kw. unit was started by Miss Virginia Junggren, daughter of Oscar Junggren of the General Electric Company. Charles P. Taft of Cincinnati, representing the board of directors, closed the switch connecting the unit with the lines of the Columbia system, and Philip G. Gossler, president of the Columbia Gas & Electric Company, made a brief address, after which the station was thrown open for general inspection. Up to last Sunday more than twenty thousand visitors inspected the new station, and at least ten thousand more were turned away owing to the congestion of road and railroad facilities.

At a banquet at the Hotel Sinton in Cincinnati on the evening of December 10 fourteen hundred leading business men of Cincinnati joined with guests from outside cities in a tribute of honor and praise to the Columbia Gas & Electric Company. Owen D. Young of the General Electric Company was the chief speaker. Others on the program were W. W. Freeman, president of the Union Gas & Electric Company; P. O. Geier, president of the Chamber of Commerce; Charles D. Jones, president of the Cincinnati Gas & Electric Company; J. M. Hutton, president of the Cincinnati, Newport & Covington Light & Traction Company, and Philip G. Gossler, president of the Columbia system. A resolution commending Mr. Freeman for his management of the Cincinnati property and a bouquet of flowers were presented to him by the Cincinnati Electric Club through F. D. Van Winkle and Charles Beltzhoover. Before returning to New York the official party of President Gossler visited the Miller's Ford station, near Dayton, and were entertained by Frank Tait and the Dayton Chamber of Commerce.

SUPERPOWER DEVELOPMENT

O. D. Young, in recounting the great development of monster plants in recent years, said:

"The creation of great power systems is a move in the right direction, providing tools for America which are commensurate with her needs. In this way the most economical generating plants may be provided. They may be located where power can be generated the cheapest either from fuel or falling water, and the power may be laid down where it can be used to the best advantage. The Columbia Gas & Electric Company has tied together in this distributing area a large number of cities and smaller communities, with the result that each can get the best and cheapest service. So the day is coming when these great systems themselves will be interconnected, and power will be drawn from that station which can furnish it most economically for use at any particular point. I welcome the day when these great integrated transmission systems and secondary lines will so far cover this country that all but the most remote may enjoy their service. I want to see this art not only run the giant industries of the cities, but I want it also to be so humble and true in its social service that we shall banish from the farmer's home the drudgery which in the earlier days killed their wives."

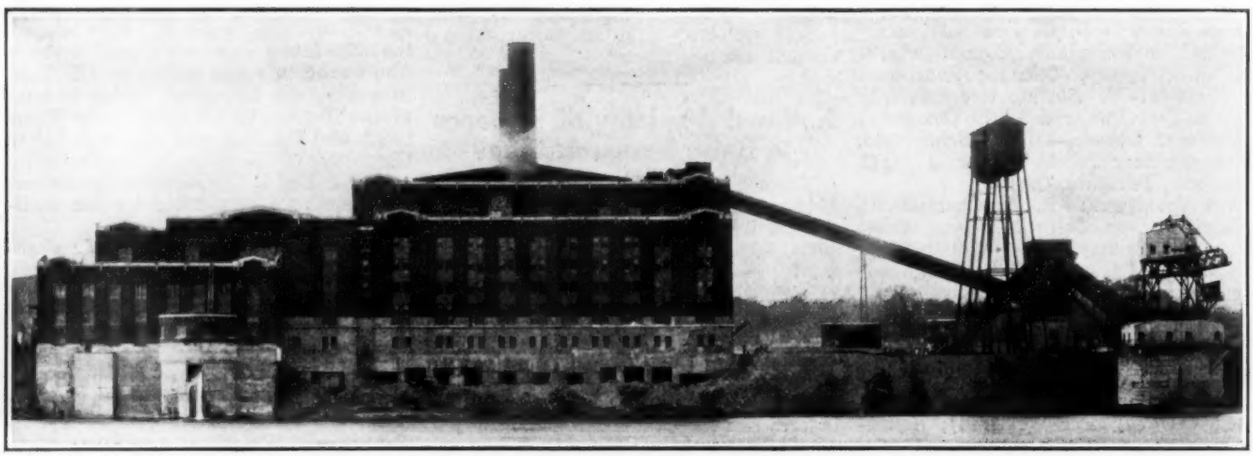
THE COLUMBIA SYSTEM

Referring particularly to the Columbia Gas & Electric Company, of which the Union Gas & Electric Company of Cincinnati is a part, President Gossler said that it serves an aggregate population of 1,000,000 persons and has 495,000 customers—280,000 gas and 215,000 electric—in an area extending from northern Kentucky cities through Cincinnati up the Miami Valley. Columbia system companies have $220,000,000 of outstanding securities in the hands of the public, at face value. Within the last twenty months the system has financed or refinanced $55,000,000 worth of securities at an average cost of $1.25 for each $100 par value, so that the company received 98¾ cents on the dollar, "the cheapest financing of like magnitude within my knowledge," Mr. Gossler said. Of the 33,000 stockholders of the system 20,000 live within its boundaries and are its customers. More than 75 per cent of the system employees are stockholders.

GROWTH IN CINCINNATI

W. W. Freeman, president of the Union Gas & Electric Company, showed by means of charts the remarkable growth of the Cincinnati company. During the past decade he said not only has the company absorbed an increase of 100 per cent in its substantial elements of cost, but during the same time it has not increased the cost of service, but actually has cut it in half. This, he said, was due to an expansion of business that has resulted in a growth of 1,100 per cent in the ten-year period. Capital expenditure in Cincinnati in the last ten years was $43,405,000. In 1914 the Union company had 10,863 residence consumers and in 1925 it had 102,499. The energy output in 1914 was 42,000,000 kw.-hr. and in 1925 it will be 457,000,000 kw-hr. Taxes are now 367 per cent of what they were in 1914, wages are 467 per cent, and gross earnings are 535 per cent. The kilowatt-hour sales are 1,079.5 per cent of what they were then, and this development of business explains how the company can absorb a 100 per cent increase in expenses and yet sell power for 50 per cent less than it did eleven years ago.

"The new power plant dedicated today is not for past business, but for future business," Mr. Freeman said. "The experience of the past ten years shows that the company is safe in building for the future far beyond the present needs of this district."



COLUMBIA PARK (MIAMI FORT) STATION OF COLUMBIA POWER COMPANY

Flambeau Reservoir Ready

Byllesby Company Finishes Wisconsin Project—Will Start Developments in Oklahoma and California

COMPLETION of a new construction project involving the expenditure of approximately a million dollars and plans for two other projects, to cost a total of approximately $2,750,000, are announced by the Byllesby Engineering & Management Corporation. The Flambeau reservoir, which will flood an area of approximately 20,000 acres and store some 6,000,000 cu. ft. of water, is the project just finished. The dam forming this reservoir is on the upper Flambeau River in Wisconsin, near the junction of the Turtle and Manitowish Rivers. It was built by the Chippewa & Flambeau Improvement Company. Although the advance estimate placed the cost of this reservoir at $1,100,000, present indications are that when final figures are available it will be found that the actual cost amounted to approximately 10 per cent less than was expected. The Flambeau reservoir will be operated by the Northern States Power Company.

The two new projects will provide increased electric generating capacity for the San Diego Consolidated Gas & Electric Corporation and the Oklahoma Gas & Electric Company.

The new construction at San Diego will include a new 20,000-hp. turbine at Station B. The total investment will be approximately $1,500,000, and the capacity of the station will be increased to 47,000 hp.

A new 27,000-hp. generating unit, with the necessary condensing equipment and auxiliaries, will be installed at the Horseshoe Lake plant of the Oklahoma Gas & Electric Company, near Harrah, 23 miles east of Oklahoma City. This installation will cost approximately $1,250,000 and will increase the generating capacity of this plant to 47,000 hp. The plant was completed and put in service during 1924, with an initial installed capacity of 20,000 hp.

Public Ownership Men Hear a Farmer's Complaint

Representatives of twenty-five cities owning and operating light and power plants in Illinois attended the first Illinois State Power Conference in Springfield, December 2 and 3, went on record against the Barr terminable permit legislation, denounced the "peril of electrical interests as powerfully merged in a few years as the steel industry," and outlined their purpose of "focusing the attention of the public on the importance of the national power question."

Carl D. Thompson, Chicago, secretary of the Public Ownership League of America, said the league stood squarely behind the 121 Illinois municipalities now owning plants. J. H. Andrews, Mayor of Kewanee, said there was a "tremendous and powerful pressure brought to bear throughout Illinois and the nation to wipe out municipal power plants and place ownership in the hands of a few men. Public utilities, publicly owned," he declared, "can give cheaper rates to consumers, because they can obtain money for operating expenses and development at a cheaper rate of interest than can other utility concerns, their officers are paid a much smaller wage, and they are not stock speculators or jobbers but are operating purely with an object of giving service to the public." I. A. Madden, county farm agent, voiced the complaint of the farmer whose lands are crossed by high-tension transmission lines. He charged that rights-of-way were granted at ridiculously low sums and that service from the lines was often denied to the farmer. He acknowledged that the individual light plant has passed the day of its usefulness and that development of electrical power for farms demands a source of supply greater than the local unit can supply.

An address was made by Delos F. Wilcox of Grand Rapids, Mich., in which, while opposing the Barr bill as one which would establish "an impossible scheme of regulation while private ownership continues and at the same time make difficult and well-nigh impossible the change from private ownership to public ownership," he outlined an indeterminate permit law which, he said, would "make regulation of private companies infinitely more effective than it is at present and also facilitate the achievement of the policy of public ownership and operation." Resolutions favoring a plan along the lines of the one advocated by Mr. Wilcox were adopted.

Boulder Canyon Dam Hearing Under Way

Secretary Hoover, E. C. LaRue and O. C. Merrill Give Testimony—Hoover Favors a Congressional Commission to Deal with This Project Solely

AGREEMENT among the states of the Colorado River basin that would permit the development of the resources of the river might be hastened, Secretary Hoover has told the Senate committee on irrigation and reclamation, which has before it the Swing-Johnson bill, were a congressional commission appointed for that sole purpose. Secretary Hoover in his testimony before the committee used as a basis for his remarks the estimate which puts the cost of the Boulder Canyon Dam at $42,000,000 for construction, $33,000,000 for electrical equipment and $27,000,000 for transmission lines. The aggregate of the various other items would make the cost of the project $115,000,000.

"The people of southern California," Mr. Hoover told the committee, "recognize that the eastern and central states probably will not be anxious to find the whole $115,000,000 for this development. The Californians, however, have expressed their willingness to make a substantial contribution to it—to come from the municipalities and the private power companies. The federal government has a substantial obligation in connection with the development.

"Some one ought to receive authority to negotiate a definite financial contract which could be laid before Congress for ratification. It possibly could be brought forward at this session of Congress. I believe we should do all we can to expedite this matter. Our path would have been smoother had the Colorado River compact been ratified, but where we have such wide differences of view we must expect difficulties. It took ten years to secure the ratification of the federal Constitution, and I doubt if there was as much emotion connected with that ratification as has been shown in the matter of water rights."

Mr. Hoover minimized the objection to the Boulder Canyon Dam based on evaporation losses. This will not become a matter of concern for seventy-five years, he declared, as all of the water in the Colorado cannot be used prior to that time. Then other dams will have been built which will have removed the objection.

For Mexican Treaty Now

E. C. LaRue, a hydraulic engineer in the service of the Geological Society, discussed the disadvantages of increasing the low-water flow of the river at this time. Among other things he said:

"If you construct the Boulder Dam so as to develop 500,000 hp., you will have regulated the river and will have increased the low-water flow to such an extent that it will be far beyond the needs of irrigation for many years to come. The increase in the low-water flow will pass into Mexico. There will be 800,000 or a million acres irrigated in that country with the water which we shall not be using. When it comes to a division of water, it will have been put to beneficial use in Mexico. In my opinion the United States never will dispossess those lands of water without paying for them.

"We should try to get Mexico to enter into a treaty now—not ten years from now. If the Mexicans do not meet us half way, they will have no complaint in later years if we take the water away by diverting it in this country. Most of the land in Mexico is owned by American citizens, and they are shrewd enough to accept this Boulder Canyon Dam."

Merrill Has Financing Plan

When O. C. Merrill, executive secretary of the Federal Power Commission, was called on to give testimony, as noted in last week's ELECTRICAL WORLD, his testimony was confined almost entirely to the discussion of the height of the dam in Boulder Canyon which would be best suited to the development of power and at the same time contribute to flood control. Mr. Merrill is to be recalled to present a plan for financing the project. He is opposed to the Swing-Johnson bill, but in case Congress should approve federal participation, he has worked out a plan whereby the federal government can lend its

credit to the project without withdrawing money from the Treasury.

Mr. Merrill told the committee that the Boulder Dam should exceed 300 ft. in height by as few feet as could be agreed upon to prevent excessive loss of water by evaporation. A dam 300 ft. high would confine the reservoir to the canyon itself. Under such conditions evaporation losses would be less than 100,000 acre-ft. per annum. If the dam were built to the maximum height proposed, evaporation losses from a broad, shallow reservoir would be as much as 700,000 acre-ft., which would mean the loss of enough water every year to irrigate 200,000 acres.

Arkansas Commission Decides for Ozarks Hydro-Electric

The Arkansas Railroad Commission handed down a decision on December 12 granting the application of the Ozarks Hydro-Electric Power Company for a permit from the state to construct power dams in White River near Yellville, also on the Big North Fork and Buffalo Rivers.

The decision was reached after a hearing that lasted three days in which the North American Company and J. B. Miller, president of the Dixie Power Company, opposed the application of the Ozarks company and claimed that the North American had acquired the rights of the Dixie Power to the sites involved. The commission's decision was reached after a hard-fought contest between the Ozarks Hydro-Electric backers and the backers of the North American application, supported respectively by two factions in the Dixie Power Company, one headed by J. H. Hand of Yellville and the other by Mr. Miller. Charles S. McCain and H. L. Remmel of Little Rock, Ark., are president and vice-president of the Ozarks company, which has an application for a permit pending before the Federal Power Commission, where also it is being contested by the North American Company. (See ELECTRICAL WORLD for October 10, page 761, and November 7, page 962.)

San Francisco's Plan Opposed by California Farm Bureau

Declaring that the breaking up of existing light and power systems would result in higher rates in the agricultural districts, the California Farm Bureau Federation has filed with the Railroad Commission of that state a protest against the plan of the city of San Francisco to condemn the San Francisco distribution plants of the Pacific Gas & Electric Company and the Great Western Power Company. No such condemnation should be allowed, the federation asserts, unless a way can be found to protect the rural districts against damage. The protest of the federation, which was presented by its manager, J. J. Deuel, and made a part of the record in the Great Western condemnation case, contends that present rates and efficiency of service are the result of a policy of consolidation which brought about the uniform load necessary to profitable operation at a reasonable rate. Without uniform loads, it is argued, electric service costs soon become prohibitive to most industries. Universal service can be accomplished only by great systems covering wide areas of territory and reaping the benefits of diversification of loads.

Boston Engineers Discuss Fuel and Power Problems

Nearly five hundred industrial, central-station and consulting engineers held a meeting on Thursday and Friday of last week under the auspices of the Affiliated Technical Societies of Boston and discussed the program of fuel and power topics published in the ELECTRICAL WORLD for December 5, page 1171. The occasion was marked by a disposition on the part of the leading speakers to define the limiting factors in the larger problems bearing upon purchased versus isolated-plant power as influenced by heat balance, and several industrial engineers of note commented favorably upon the broadening field of central-station service to industry. Extracts from several of the papers will be presented topically in subsequent issues of the ELECTRICAL WORLD.

Giant Power to Come Up Again in Pennsylvania

The anticipated special session of the Pennsylvania Legislature was called on Tuesday by Governor Pinchot to assemble on January 13. Among the eight stated subjects for its consideration are regulation of the anthracite coal business, laws providing for the carrying out of the Governor's giant-power plans and approval of the Delaware River tri-state compact with New York and New Jersey.

The Governor is explicit about his giant power plans, which were rejected by the 1925 Legislature. He then had nineteen bills before the House. This time fewer bills, but measures covering the essential points of the others, are proposed. These would define the power of a giant power board, authorize incorporation of giant power companies, provide for cheaper distribution of electrical energy, regulation of rates and service and authorize incorporation of generating companies. The purpose of the entire series of bills is to prevent "the great electrical monopoly now being consolidated" from being formed without proper consideration for the public welfare.

"The supreme importance of giant power," the Governor said, "is one of my reasons for calling this extra session." Main emphasis, however, is put on his plan to declare the anthracite-coal industry a public utility and to provide for its regulation by the state.

Harvard Professor Adds a Utility to His String

The Salem (N. H.) Electric Company, operating in Salem and Windham, has been purchased by Prof. Arthur S. Dewing, Harvard University, under special authorization of the Public Service Commission of New Hampshire. The purchasing price of this property is $51,000, and the intention of the new owner is to reduce the rates, extend the lines and otherwise improve service for the customers, who number about six hundred. The Salem company has been in operation twenty-five years. It was recently changed from steam to hydro-electric operation. Professor Dewing has a number of other utility holdings in various sections.

Northwest Inspectors' Association Organizing

Those interested in electrical inspection in Oregon and Washington are organizing the Northwest Association of Electrical Inspectors, the first meeting of which is to be in Portland on January 11 and 12. Leaders in the movement are H. A. Patton, electrical engineer, Washington Surveying and Rating Bureau, Seattle, and F. D. Weber, electrical engineer, Oregon Insurance Rating Bureau, Portland. A tentative constitution providing for an organization modeled after the California association has been drafted. This provides for three classes of membership—active, associate and industrial. Active members shall be persons engaged in inspecting or supervising inspection of electrical installations in behalf of city, county, state or national authorities or of insurance organizations; associate members shall be persons engaged in inspection in behalf of public service agencies other than the above, while industrial membership shall include those engaged in electrical industry as engineers, contractors, manufacturers and members of electric public utility companies. Nationally known men of the industry as well as local authorities will attend.

Way Paved for Consolidation in New Orleans

The second and final ordinance paving the way for the consolidation of the Consumers' Electric Light & Power Company and the Citizens' Light & Power Company with New Orleans Public Service, Inc., has been passed by the Commission Council of New Orleans by a three-to-two vote. Mayor Behrman and Utilities Commissioner Hall voted favorably.

Property Commissioner Klorer, one of the dissentients, expressed the view that the amount which the Public Service company should be allowed to add to its rate base as a result of the consolidation should include the value only of such of the properties of the companies being absorbed as could be used by Public Service. In this particular he assailed particularly some of the holdings of the Consumers' company, including that company's power house, which he held was in such a state of repair that it could not be rehabilitated to advantage.

H. Generes Dufour, representing New Orleans Public Service, declared that the consolidation was keyed on a sound basis financially, that Public Service was not paying more than the properties were worth, and that the Council in authorizing the consolidation was eliminating a situation in the public utility field that threatened to prove costly to the public.

New York State Rate Cuts

Thirty-one Companies Make Voluntary Reductions in 1925 Which Save Householders $3,273,000

VOLUNTARY rate reductions to domestic consumers made by the electric utility companies of New York State during the present year have reduced household electric bills approximately $3,273,000, according to a statement by the New York State Committee on Public Utility Information, this estimated saving being based on the change in rates and the total kilowatt-hours sold in each community affected. Thirty-one companies, serving communities in which live more than four million people, have lowered their domestic rates.

These reductions have been made possible by a variety of causes, among which are the decreased cost of production by improvements in generating technique and equipment, the replacement of numerous small and obsolete generating plants by large and more efficient central stations, the interconnection of steam and hydro-electric plants, permitting the interchange of surplus energy over large districts, and the building of high-power transmission systems for the distribution of electricity from strategic sources to large distant markets.

Among the utilities which have made rate reductions are the Binghamton Light, Heat & Power Company, the Brooklyn Edison Company, the Buffalo General Electric Company, the Central Hudson Gas & Electric Company, the New York Central Electric Corporation, the Niagara Electric Service Corporation, the Olean Electric Light & Power Company, the People's Gas & Electric Company of Oswego, the Syracuse Lighting Company, the Tonawanda Power Company and the Long Island Lighting Corporation.

Potomac Electric Power Will Cut Rates on January 1

Under its agreement with the Public Utilities Commission of the District of Columbia, the Potomac Electric Power Company of Washington is obligated to reduce its rates whenever they yield more than 7½ per cent return during any one year. The return this year has been above that figure, and President William F. Ham wrote to the commission as follows:

"We now have complete figures for the ten months ended October 31, 1925, from which it would be possible to estimate the results for November and December, 1925. It is, however, fair to state that such estimates, however carefully made, might, on account of the many elements involved, differ quite materially from actual results. We wish to inquire whether it would be agreeable to the commission and, in its judgment, consistent with the decree to proceed in this way. If so, the company, appreciating the large increase it has enjoyed in the volume of its business due to the decrease in rates the first of the year, is willing to put into effect reduced rates on January 1, 1926."

Should the commission insist on the actual figures for the whole year, Mr. Ham said, it was unlikely that the contemplated reduction could be made before March 1, 1926. The commission has accepted the company's offer.

More Plans for Hydro Plants in Western Washington

Two sets of applications just filed with the State Supervisor of Hydraulics at Olympia, Wash., by Joseph Roane of Vancouver, Wash., and R. B. Metcalfe of Portland, Ore., both representing the Spirit Lake & Power Company, pertain to the projected generation of 121,600 continuous horsepower in the mountainous portion of Cowlitz County, Wash., at an estimated cost of $10,700,000. Mr. Roane files on four projects and Mr. Metcalfe, who is president of the company, on two.

The four Roane sites are all on the Toutle River, a tributary to the Cowlitz and Columbia Rivers. They would cost $7,800,000 and would develop 72,000 hp., according to the application—29,000 hp. at Elk Rock, 6,800 at Green Canal, 23,000 hp. at the "Adler site" and 13,200 hp. at the "Roane site."

The two Metcalfe sites, it is estimated, would furnish a total of 49,600 continuous horsepower at a cost of $3,000,000. One of these sites, rated at 34,600 hp., is at the junction of Green River and Hoffsteadt Creek, flowing into the Toutle River, and the other, rated at 15,000 hp., is on the Toutle itself. A total fall of nearly 1,100 ft. would be utilized by these two plants.

Four Applicants for Hydro Sites on Cowlitz River

The multiplicity of projected plans for water rights on the Cowlitz River in western Washington, already referred to in the ELECTRICAL WORLD, resolved at the hearing on November 23 into four formal applications on filings made by these contenders:

C. C. Garland of Tacoma, backed by E. W. Backus, a Minneapolis lumber and paper-mill financier, who wants sites at Mayfield and Mossyrock.

H. W. Crozier of Chehalis and Aberdeen, representing the Federal Light & Traction Company of New York, filing on three sites, Mayfield, Mossyrock and Big Bend.

The Cascade Electric Company, organized by Elbert M. Chandler of Olympia and Henry L. Gray of Seattle, filing on the Big Bend site.

J. G. Kelley of Portland, filing about 6 miles below Mayfield.

At the hearing both the Garland interests and the Crozier interests urged that the case be determined upon the basis of the greatest feasible development possible, as permitted by law, rather than upon the basis of priority of filing. While the Mayfield site would not interfere with the Mossyrock site, were a moderate-size dam, such as 120 ft., to be used, it would be ruined as a power site with a 300-ft. dam at Mayfield. Similarly the Big Bend site, farther upstream, about 45 miles southeast of Chehalis, would be interfered with were a 300-ft. dam to be built at Mossyrock.

Insull Interests Seek to Buy Chicago Suburban Company

Permission to purchase the properties of the Chicago Suburban Power & Light Company and to extend electric light and power facilities to the communities now served by the former company was asked in a petition filed on December 4 with the Illinois Commerce Commission by the Public Service Company of Northern Illinois. If the commission approves the purchase contract, the Insull company not only plans an immediate large construction program in the communities served, but also will put in force the substantially lower rates now enjoyed by other cities and towns it serves.

The communities which would be immediately benefited by the transaction are West Chicago, Winfield, Villa Park, Westmore, Wayne and High Lake, as well as the territory adjacent to them. In addition to serving these communities directly, the Chicago Suburban Power & Light Company also furnishes electric light and power at wholesale to the municipalities of Batavia, Geneva, St. Charles and Lombard.

Before the Federal Power Commission

The California-Oregon Power Company, under the terms of a preliminary permit granted November 27, 1922, has applied for a license providing for the construction of four power houses on the Klamath River in Klamath County, Ore., and in Siskiyou, Cal. The installation is to be as follows: Power house No. 1, 97,000 hp.; power house No. 2, 51,000 hp.; power house No. 3, 24,000 hp.; power house No. 4, 48,000 hp.

The Utah Power & Light Company has applied to the Federal Power Commission for a license covering its constructed project on Battle Creek.

The Mississippi Power Company of Gulfport has applied for a license to provide for the crossing of public lands in Jackson County, Miss., with one of the transmission lines it expects to build in the near future.

Sixty-Million-Dollar Radio Suit Filed by Fessenden

Suit declaring triple damages amounting to $60,000,000 was filed December 3 in the United States District Court at Boston on behalf of Prof. Reginald A. Fessenden of Chestnut Hill, Mass., against the General Electric Company, Radio Corporation of America, Westinghouse Electric & Manufacturing Company, Western Electric Company, Inc., United Fruit Company, Wireless Specialty Apparatus Company and International Radio Telegraph Company, under the Sherman act and Clayton anti-trust law. The defendants are charged with lessening and finally destroying competition, restraining commerce and injuring the plaintiff through combination and control of radio apparatus manufacture and use. A list of between two hundred and three hundred inventions, title to which it is contended resides in the plaintiff, is appended to the bill.

Briefer News

Transmission Line Across Sandusky Bay Finished.—The Ohio Public Service Company has erected the eighth and last tower for its transmission line across Sandusky Bay, near the city of Sandusky, Ohio. This line, the first to be built across the bay and an important link in the company's interconnection plans, is 8,500 ft. in length.

North Dakota Plants Are Merged.—The Hughes Electric Company of Bismarck, N. D., has recently purchased for $225,000 the Mandan (N. D.) Electric Company, as well as small plants at Hebron, Glen Ullin, Halliday, Hazen, Beulah and other places. High-tension transmission lines are being built through Dunn, Mercer, Oliver, Morton and Stark Counties.

Wapsie (Iowa) Company Drops Old Name.—The Wapsie Power & Light Company is hereafter to be known as the Mount Vernon division of the Iowa Railway & Light Corporation, with J. H. Torner as manager. There are now four major divisions of the Iowa Railway & Light with headquarters at Cedar Rapids. The Mount Vernon division includes all the Wapsie territory.

Greensburg (Ind.) Gas & Electric Probably to Change Hands. — The Hoosier Public Utility Company of Chicago has filed with the Indiana Public Service Commission an application for permission to buy all the property, rights and franchises of the Greensburg (Ind.) Gas & Electric Company. The petition lists the reproduction cost of the Greensburg property at $486,877. Albert Pierce is president of the Chicago company. A similar petition, joining in the request for authority to make the deal, was filed by the Greensburg company.

Potomac Electric Power Company Improving Maryland Service.—The Potomac Electric Power Company of Washington, D. C., has asked permission to build a 13,000-volt line to Rockville, Md., which, with the present line on the other side of the city, going through Georgetown, will form a transmission ring, permitting improvement in the service to Maryland customers. The old line, operated at 25 cycles, is to be rebuilt and all put on a 60-cycle basis.

Trustees Appointed for National Museum of Engineering and Industry.—A board of trustees has been appointed for the proposed National Museum of Engineering and Industry. Samuel Insull of Chicago is president, and other trustees are Nicholas F. Brady, Prof. D. C. Jackson, John W. Lieb, Fred R. Low, Dr. M. I. Pupin and Elmer A. Sperry. The four major national engineering associations are specially represented, Gano Dunn and Dr. F. B. Jewett acting for the American Institute of Electrical Engineers.

Wyoming Company Takes Over Plant in Baker, Mont.—The Baker (Mont.) Light & Power Company has been taken over by the Midwest Utilities Company of Casper, Wyo., which will maintain an office in Baker.

New Hampshire Companies Unite.—The Public Service Commission of New Hampshire has approved the sale of the entire outstanding capital stock of the Plaistow Electric Light & Power Company to the Exeter & Hampton Electric Company, which operates in Exeter, Hampton and surrounding towns.

Oil Light in Portland (Me.) Harbor to Be Replaced by Electric Beacon.—"Two Lights," the great beacon that looks across Casco Bay from Cape Elizabeth at the entrance of the harbor at Portland, Me., has yielded at last to electricity. Some time this month the old system of illumination by incandescent oil vapors will pass on, and a new light with a range of 40 miles will guide shipping into the harbor. The existing lighthouse station at Portland was established almost a hundred years ago, and for many years there were two towers situated more than a mile apart. Since 1924 there has been only one, greatly enlarged. This in turn is to give way to an electric beacon of 740,000 cp.

Judges Appointed for New York Edison Radio Play Contest.—Arthur Williams, vice-president in charge of commercial relations of the New York Edison Company, who is offering prizes for the best radio plays dramatizing the contribution of electricity to modern life, in conjunction with the New York Edison hour on the air, has announced that Cosmo Hamilton, an English novelist and playwright; B. C. Forbes, editor of *Forbes Magazine*, and James H. McGraw, president of the McGraw-Hill Company, will act as judges in the contest.

Quick Restoration of Interrupted Service in Los Angeles.—Failure of an outgoing 2,200-volt feed cable at a pothead in a distribution substation of the Bureau of Power and Light of Los Angeles recently caused a voltage regulator to explode, setting fire to the substation and destroying the low-tension equipment entirely, though the high-tension equipment was not seriously affected. Service in Highland Park, Sierra Vista, Eagle Rock and Garvanza was interrupted for six hours. Officials of the Power Bureau say that the unit-type construction used in building alone made it possible for the repair crew to get the station back on the line in this remarkably short time.

Galveston's Rival Plants Likely to Be United.—Completion of a contract between the Cities Service Power & Light Company and the Galveston-Houston Electric Company for the acquisition by the latter of the Brush Electric Company was announced last week. Transfer of the property is contingent on approval by the Galveston city government. The purchasing company is to be the Galveston Electric Company, which is under the executive management of Stone & Webster and is a subsidiary of the Galveston-Houston Company. The deal will give to the Galveston Electric the entire city territory. While no price has been named, it is believed the amount will be in the neighborhood of $2,000,000.

Municipal Ownership Wins in Owatonna, Minn.—A thirty-year fight for municipal control of public utilities has ceased in Owatonna, Minn., and the Owatonna Public Utilities Commission has started taking over the service of the Interstate Power Company, the Mayor and the president of the utilities company having signed an agreement whereby the city will control the field locally.

First Step Taken in Ozarks Development.—Initial steps in preparing the site for a hydro-electric plant on the Current River in Missouri by interests controlled by the Superpower Corporation of Missouri are reported to have been taken. This plant will be 70 miles southeast of the Osage River development of the Missouri Hydro-Electric Power Company, also controlled by the Superpower Corporation. Three other developments are included in the main project. The extensive plans for developing the Ozarks region, in which these rivers are, were detailed in the ELECTRICAL WORLD for October 31, page 917.

A Million for Additional Transmission Lines in California.—Included in the San Joaquin Light & Power Corporation's twelve-million-dollar budget for 1926, which was noted on page 1224 last week, is almost a million dollars for new transmission lines and extensions. These include the 28-mile, 110-kv. line from the Kerckhoff power house to Sanger (21 miles of steel and 7 miles of wooden-pole construction), paralleling the existing line of the same voltage, which is to be rushed to completion, and a 12-mile line from Piedra to Sanger, transmitting power from the coming Balch station. Another million dollars will be spent on substations.

New Development Plans for Southern Iowa.—A development which will eventually make Ottumwa the electric power center of southern Iowa is announced by the Iowa Southern Utilities Company. The plan involves building a 66,000-volt transmission line from Ottumwa to Grinnell, connecting with Sigourney and Washington and supplying energy to fifty or sixty towns to the northeast of Ottumwa. Ultimately the Ottumwa plant will also be connected with Centerville and sixty other towns to the southwest. The new lines will also connect Ottumwa with Des Moines, Oskaloosa, Burlington and Keokuk.

Several Years' Competition in Same Territory Ends.—The New York Public Service Commission has given its consent to the purchase by the Seneca River Power Company of Baldwinsville of the distribution system of the Phoenix Gas & Electric Company in the village of Phoenix, Oswego County.

Both companies have been distributing electricity in the village for several years in competition. When the generating plant of the Phoenix Company burned last April the Seneca Company took over and served its customers with electricity.

West St. Louis Water & Light Company Absorbed.—Merger of the West St. Louis Water & Light Company and the West St. Louis Pipe Line Company under the name of the St. Louis County Water Company is announced. The power installation is rated at 540 kw., serving a suburban community with electricity.

San Diego to Have New Substation.—The San Diego (Cal.) Consolidated Gas & Electric Company will start work early next year on a new 3,750-kw. substation for city distribution, to be known as Substation F. The initial installation will include two 11,000-volt incoming feeders and four 4,000-volt outgoing feeders as well as street-lighting circuits. A feature of the station will be the use of supervisory control by which the station will be operated from Substation C in another section of the city. The 4,000-volt feeders will be equipped with regulators and automatic reclosing breakers. Architectural features of the building will harmonize with surrounding buildings, and the substation as a whole will be one of the most modern on the Pacific Coast.

Dix River Plant Now in Regular Service.—The Dix River dam and power station of the Kentucky Hydro-Electric Company, after ten days of operation on a regular schedule, was declared last week to be giving excellent service. Sufficient water is flowing into the 30-mile lake to enable the power station to maintain an output of 7,000,000 kw.-hr. during December without drawing heavily upon the water already stored. The station is supplying more than 15,000 hp. for Louisville and Lexington consumption, while additional energy is furnished to the transmission system of the Kentucky Utilities Company. The entire output of the station has been sold from the first moment of operation. An additional 40 ft. of water will fill the lake to overflowing, and this is expected during February.

Electrical Men Inspect South Dakota Rural Line.—The sixth of the series of sectional meetings being held in Minnesota, North and South Dakota by the North Central Electric Association was convened at Sioux Falls, S. D., on November 30. The morning was devoted to an inspection of the Renner rural line built by the Northern States Power Company for experimental purposes, Prof. R. L. Patty, the project director, conducting the party of electrical men over several farms. Average use of electricity has increased from around 30 kw.-hr. to 130 kw.-hr. per month per farm. The afternoon was taken up by a discussion on the problems of the industry. Seventy-six were present. O. A. Rofelty, manager Northern States Power Company at Sioux Falls, presided.

Central Illinois Acquires Alvin Grain & Electric.—The Central Illinois Public Service Company has purchased the Alvin Grain & Electric Company holdings for $100,000 plus sums recently paid for extensions and will continue service in the villages of Alvin, Potomac, Henning, Armstrong, Gifford and Penfield, Ill.

Foshay Properties in an Iowa District Change Hands.—The Iowa division of the Tri-State Utilities Company, which has furnished Central City, Center Point and other towns in the same section with energy, has been acquired by the Iowa Railway & Light Corporation of Cedar Rapids. F. J. Cross organized the plant as the Electrical Service Company, but sold his interests to the Foshay company of Minneapolis a few years ago. The present sale includes all the Foshay interests in the district.

Associated Gas & Electric Absorbs Ten Small New York Properties.—The New York Public Service Commission has made final orders in ten separate proceedings by which the New York State Gas & Electric Corporation, a subsidiary of the Associated Gas & Electric Company, has had ten New York utility properties transferred to it. The utilities transferred are the Southern New York Power Company, Madison Power Company, Inc., Sullivan County Light & Power Company, Waterville Gas & Electric Company, Delaware County Electric Light & Power Company, New Berlin Light & Power Company, Fleischman Light, Heat & Power Company, Moravia Electric Light & Power Company, West Branch Light & Power Company and the Steven O'Connor electrical plant. These properties are in territory contiguous to that served by the Gas & Electric Corporation and were connected with the corporation's system pending the proceedings for their acquisition.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations, with their secretaries, is published in the first issue of each volume. For latest list see ELECTRICAL WORLD, July 4, page 50.]

American Physical Society — Kansas City, Dec. 28-30. H. W. Webb, Columbia University, New York.

Northwest Association of Electrical Inspectors—Multnomah Hotel, Portland, Ore., Jan. 11-12. F. D. Weber, 401 Lumbermen's Bldg., Portland.

Kentucky Association of Public Utilities—Brown Hotel, Louisville, Jan. 15. E. F. Kelley, Louisville Railway Co., Louisville.

Rocky Mountain Section, N. E. L. A.—Hot Springs Hotel, Idaho Springs, Col., Jan. 25-26. O. A. Weller, Public Service Company of Colorado, Denver.

Western Association of Electrical Inspectors—Hotel Sherman, Chicago, Jan. 26-28. W. S. Boyd, 175 West Jackson Blvd., Chicago.

American Institute of Electrical Engineers—New York, Feb. 8-12. F. L. Hutchinson, 33 West 39th St., New York.

Southwestern Public Service Association—Galveston, Tex., April 13-16. E. N. Willis, 403 Slaughter Bldg., Dallas.

Southwestern Geographic Division, N. E. L. A.—Galveston, Tex., April 13-16. S. J. Ballinger, San Antonio Public Service Co., San Antonio.

National Electric Light Association—Atlantic City, N. J., May 17-21. M. H. Aylesworth, 29 West 39th St., New York.

North American's Trunk Line in Wisconsin Almost Finished.—Another milestone was reached in the development of interconnection in Wisconsin when the properties of the Wisconsin Traction, Light, Heat & Power Company at Appleton and the Milwaukee Electric Railway & Light Company at Milwaukee were tied in through the completion of the second section of the 132-kv. steel-tower transmission line between Plymouth and Appleton, on which work was started last February. The first section of the line, between Milwaukee and Plymouth, was finished in 1923. With the completion of the line between Appleton and the Peninsular Power Company's property across the Michigan border all the plants, both steam and hydro, controlled by the North American Company in Wisconsin and northern Michigan will be linked together.

Meter Men Gather at Springfield, Ill.—More than three hundred meter men from many parts of the country attended a joint session of the N. E. L. A. Great Lakes Division and national meter committees in Springfield, Ill., December 8 to 11. There was an unusually well-planned and comprehensive display of meter and related equipment, furnished by the manufacturers of the country and held in the auditorium of the Sangamo Electric Company. All meetings but one of both committees were closed sessions. Announcement was made by the sub-committee on standardization to the effect that standardization of meter terminal chambers had been accomplished. The general session was addressed by B. P. Romain of the Weston Electric Instrument Corporation, F. C. Holtz, chief engineer Sangamo Electric Company, and J. E. Miller, who represented the Milwaukee Electric Railway & Light Company.

New Power Map of Virginia.—The United States Geological Survey, cooperating with the Virginia Geological Survey, has just published and will supply for 50 cents a new edition of the map showing electric power stations and transmission lines used in public service in Virginia and the river-gaging stations maintained or proposed. The map has been prepared in connection with the work of collecting up-to-date statistics relating to the production of power at central stations and with a co-operative investigation of Virginia's water resources. The Geological Survey points out that Virginia, with its large potential water power, of which only 11.2 per cent has been developed, lies between the interconnected transmission systems of the South and of the Northeast, and that the water powers of Virginia will be an important factor in bringing about the eventual connection of these two systems.

Men of the Industry

Prof. F. D. Paine Takes Office on Iowa Rural Service Committee

Frank D. Paine, professor of electrical engineering at Iowa State College, Ames, Iowa, has been appointed assistant director of the Committee on the Relation of Electricity to Agriculture, with headquarters at Ames. In addition to his work on the teaching staff of the Iowa State College, with which he has been connected since 1912, Mr. Paine has served as a consulting engineer for many of the important

F. D. PAINE

public utility companies in Iowa. He has taken active part in the work of the Iowa Section of the National Electric Light Association, serving as an associate member on the rural lines committee and the committee on meters. Since September, 1924, he has served as supervisor of the Iowa project on rural electrification, "Iowa's Rural Community for Electric Development," which is at Garner, Iowa. He was the originator of the idea of a short course for electric metermen, directing the first one at Ames in 1919 and having directed one each year since. Mr. Paine has been prominently identified with the American Society of Agricultural Engineers, serving as chairman of the committee on nomenclature and standard practice. In order that he may be free to devote his attention to the work of the committee a leave of absence for the period of a year was granted to him by the Iowa State College.

G. G. Allen of New York has been elected president of the Duke-Price Power Company, Ltd., to succeed the late James B. Duke.

W. D. Drysdale, formerly plant engineer of the Trenton Channel plant of the Detroit Edison Company, has been appointed assistant engineer of power plants of that company.

Guy P. Newbern has been named director of the Tennessee Public Service Information Bureau. Mr. Newbern is a native of Tennessee and formerly engaged in newspaper work in that state. More recently he has been connected with the Missouri Pacific Railroad in publicity and public relations work.

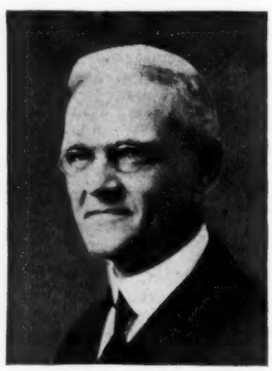
J. Lee Potter, formerly manager of the Newburyport (Mass.) Gas & Electric Company, has become associated with the Arthur W. Wood Company, investment bankers of Boston.

Frank G. Perley, formerly power engineer with the Pennsylvania Power & Light Company, Allentown, Pa., has been appointed industrial power engineer of the Connecticut Light & Power Company.

Earle W. Hodges, for three years director of the Arkansas Public Service Information Bureau and editor of the *Arkansas Utility News*, has resigned to become connected with the public relations department of Henry L. Doherty & Company. A native of Newark, Ark., Mr. Hodges has had considerable experience in newspaper work and served for three consecutive terms as secretary of his native state. When the Arkansas Public Service Information Bureau was organized in the spring of 1922 he became its head.

Austin Burt Resigns Vice-Presidency of Iowa Utility

Austin Burt, vice-president of the Central Iowa Power & Light Company in charge of engineering, has resigned from that office and will soon leave Iowa for California. Illness in Mr. Burt's family has necessitated his severing a connection with the Waterloo utility, with which and its predecessors he spent twenty-three years. A graduate of Cornell University, Mr. Burt became a student in the Allis-Chalmers plant at Milwaukee, and following the completion of his studies there he became identified with the electric plant at Cedar Falls, Iowa, where he remained until 1902. In that year he joined the Waterloo utility in the capacity of gen-



AUSTIN BURT

eral manager. When the Citizens' Gas & Electric Company of Waterloo and the Northern Iowa Gas & Electric Company of Humboldt were merged to form the Central Iowa Power & Light Company Mr. Burt became a vice-president in the new organization.

A. K. Ellis Promoted to Vice-Presidency in Wisconsin Utility

A. K. Ellis, general manager of the Wisconsin Traction, Light, Heat & Power Company, who is recognized as one of the pioneers in the organization and development of power and transportation utilities in Wisconsin, has been promoted to the vice-presidency of that company, together with the North American Company's other subsidiaries in northern Wisconsin and in the upper peninsula of Michigan. Mr. Ellis succeeds S. B. Way of the Milwaukee Electric Railway & Light Company as vice-president, filling the vacancy left open when Mr. Way was selected to succeed the late John I. Beggs as president of the company.

A. K. ELLIS

Mr. Ellis will remain as secretary-treasurer of the company.

Mr. Ellis' career in the utility business, which embraces thirty-four years, twenty-eight of which have been spent in Appleton, has been a colorful one. He joined, as assistant to the superintendent, the then recently organized traction company at Appleton in 1897 and was promoted in 1899 to the post of superintendent of railway and power plants, from which office he was advanced to general superintendent in 1913. He held that position until the North American Company acquired control of the property in 1923, when he was appointed general manager. Since that time this holding company has acquired numerous other properties in this territory, the operation of which has been entirely in his hands.

Obituary

Franklin I. Fuller, first vice-president of the Portland (Ore.) Electric Power Company, died December 16 after a short illness. Mr. Fuller began his career in the public utility business in 1892, when he joined the street-railway company in Portland. Advancing consistently in the ranks of the organization, he became general manager and later president. He remained in this position until the Portland Railway, Light & Power Company was formed in 1906, when he became vice-president, remaining in that office when the name of the company was changed to Portland Electric Power Company. Mr. Fuller was sixty-seven years of age.

Commission Rulings

Indiana Commission's Authority Over Municipal Plants.—Residents of Logansport, Ind., petitioned the Indiana Public Service Commission to investigate the municipal electric plant, claiming that the city was diverting large sums of money from the revenues of the plant to the purchase of real estate and erection of buildings not necessary to its operation, thereby imposing on the citizens an improper burden in the shape of high rates. The commission, denying the city's allegation that it has no authority over municipal plants, found that the rates in effect provided a return in excess of a reasonable one and ordered both a new and reduced schedule and the establishment and maintenance of a separate depreciation fund according to rules formulated by the commission.

Evaluating Water Rights.—An estimate of the value of water rights to be transferred to a public utility company should be rejected when the evidence shows neither actual cost nor any definite calculation indicating the method of arriving at value, especially when the estimated value would attach to the water right only after the utility project had been constructed and placed in operation. This decision was made by the California Railroad Commission in granting authority to the Lake County Water & Power Company to acquire public utility property and issue bonds. The commission also observed in this case that an issue of bonds by a public utility which has submitted no copy of its proposed deed of trust or mortgage, securing the payment of its bonds, and which has made no arrangements for the sale of the bonds, except bonds in payment of notes, should be disapproved where the earnings of the property to be acquired, the conditions of such property and the competition under which the property is operated create considerable doubt as to whether operation will produce a profit with which to pay the bond interest.

Right of Protection Against Competition Is Based on Adequate Service.—The New Jersey Board of Public Utility Commissioners denied an application from the West Milford Electric Company for authority to construct and operate an electric light, heat and power distribution system in a township served by the Orange & Rockland Electric Company in order that the existing utility, which opposed the application, might render service, although it had failed to do so in the past. The commission said that it had been its policy to protect a utility furnishing adequate service from competition, that the territory in question had not been served by the existing utility, which apparently took no interest in it until a local agitation for service began, and that the applicants were seeking to form a local company. The board said: "The community proposed to be served by the applicant company is entitled to electrical service at reasonable rates. In view of the expressed policy of the board to protect a utility adequately serving a given territory at reasonable prices, the board will afford the Orange & Rockland Electric Company an opportunity to enter upon this territory and serve it if it shall act promptly in so doing, but the board will not look with favor upon the latter company claiming the right to serve this territory and failing so to do."

Recent Court Decisions

Deposits Made by Customers to Obtain Service Must Be Held in Bank and Interest Paid.—Judgment has been rendered by the Circuit Court at Noblesville, Ind., awarding William Sopher interest on his deposit with the Indiana Gas & Light Company. The company required every customer to deposit $5 when a meter was installed, but paid no interest on the deposits, using them in its business. The court sustains the Indiana Public Service Commission in ruling that this cannot be done, that the deposits must be held by the company in banks and that interest must be paid upon them.

Jurisdiction of Commission Conferred Only by Statute, Never by Consent of Parties to Dispute.—In Union Indemnity Company vs. Railroad Commission, an action concerning a permit to sell securities under the Wisconsin "blue-sky" law, the Supreme Court of Wisconsin reversed a judgment ordering the Insurance Commissioner of the state and the Railroad Commission to issue the permit applied for and ordered the commission to dismiss the proceedings. The Supreme Court declared that the subject of jurisdiction of administrative boards and commissions is always open to judicial review and that such jurisdiction is conferred by statute alone and cannot be conferred by consent of parties. (205 N. W. 492.)*

Liability for Death of Servant Who Departs from Sphere of Assigned Duty.—In Barnes vs. Phoenix (N. C.) Utility Company, a suit to recover damages for the death of an employee from electric shock, the old question of contributory negligence was raised. The man killed was repairing a roof and went underneath it to clinch a nail when he came into contact with uninsulated trolley wires. The company maintained that he had no orders to work anywhere save on top of the roof and that if he thought it necessary in the performance of his task to go under the roof he must have seen the wires and it was his duty to ascertain whether the current was turned off. The Supreme Court of North Carolina sustained a verdict against the company, holding that the man was acting in the line of his duty even though he had left the sphere of work assigned to him and that the company had failed to supply him with a safe place in which to work. (130 S. E. 1.)

Company Held Liable for Injuries from Falling Insulator.—Mrs. Kuether, a pedestrian who was struck by an insulator, or by part of a broken insulator, which fell from a cross-arm she was passing, or was dropped by a workman, and injured her hand severely, sued the Kansas City Light & Power Company for damages. The Kansas City Court of Appeals has sustained a lower court in awarding them, disregarding a plea by the company that unless it could be shown that there was a plain defect in the insulator which the workman could see in time to avoid its use, the plaintiff could not recover. (276 S. W. 105.)

Commission May Not Prohibit Company Rules Made in Interest of Safety Because of Expense to Customers.—Asserting its right to overrule the Public Service Commission where the evidence does not support the latter's findings, the Supreme Court of Missouri declared that the commission had erred in annulling safety rules made by a central-station company (State ex rel. Kansas City Power & Light Company vs. Public Service Commission). These rules concerned the character of a fuse and switch box which the company required a consumer to install as a condition precedent to supplying him with electric energy, and the evidence showed that the type of box required afforded much better protection to life and property than the old style of boxes. The new boxes involved an additional cost of installation to each consumer of $5 to $6 per meter, and the court held that this additional cost was insufficient reason for the commission's order. (275 S. W. 940.)

"Good Faith" Purchase of Electric Company's Property Held Valid, Though Commission's Approval Was Lacking.—The point at issue in Dearborn (Mo.) Electric Light & Power Company vs. Jones was whether a sale of public utility property made without the consent of the Public Service Commission, which is required by statute where property is necessary or useful to a utility company, was void. The United States Circuit Court of Appeals on rehearing sustained a former decision that it was not, though modifying the grounds on which this finding had previously been based. The decision laid down the principle that even were it granted that the property was necessary or useful to the company in the performance of its public duties and that no consent order was obtained, the sale would not be void if the purchase was one for value in good faith. The elements which make a purchase in good faith for value—an actual sale, a present consideration and an honest, legally justifiable belief that the vendor has the right to sell—were held by the court to have resided in the transaction. (7 Fed. (2d.) 806.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Manufacturing and Markets

N.E.L.A. Men Oppose All-Metal Propaganda

For Any Safe and Economical Wiring Plan—Wire Sizes for Services in Flats with Demand Factors

AT A MEETING of the N.E.L.A. wiring committee held in Chicago on November 16 there came up for discussion the present propaganda of the Association of Electragists International covering all-metal construction. The wiring committee expressed itself as being emphatically opposed to propaganda on any particular system of wiring which, if universally adopted, would tend to close the door to any other system, and such, it held, would be the effect if the all-metal construction idea was universally adopted. The committee further desired to go on record as not being in favor of any particular system of wiring to the exclusion of any other system. The committee feels that any system of wiring should be encouraged which combines economy with adequate safety.

Another matter that came up in the wiring committee meeting was the proper size of wire for service and mains in apartment buildings using demand factors. The purpose of discussing this matter in the wiring committee was to bring to the attention of the committee the value of getting into local electrical codes and, if possible, into the National Electrical Code, through tables or rules, the use of demand factors in the calculation of service mains and sub-mains for electrical installations. The committee feels that it is more difficult to determine these factors for power installations, but that a start at least can be made on lighting installations in apartment buildings, as has been done in Chicago. The use of a table in Chicago, as shown herewith, has been in vogue for several years and has resulted in a saving on the electrical installation, with no added hazard.

SIZE OF WIRE FOR SERVICES AND MAINS IN APARTMENT BUILDINGS USING DEMAND FACTORS

110–220-Volt, Three-Wire Mains

Wire Size No.	Watts	D.F. 100% 1 to 5 Apts. Area	D.F. 95%, 6 to 10 Apts. Area	D.F. 90%, 11 to 15 Apts. Area	D.F. 85%, 16 to 25 Apts. Area	D.F. 80%, 26 to 35 Apts. Area	D.F. 75%, Above 35 Apts. Area
14	3,300	4,400	4,620	4,840	.....	.....	.....
12	4,400	5,867	6,160	6,454	6,747	.....	.....
10	5,500	7,333	7,700	8,066	8,433	8,800	.....
8	7,700	10,266	10,779	11,293	11,806	12,319	.....
6	11,000	14,667	15,400	16,134	16,867	17,600	.....
4	15,400	20,533	21,560	22,586	23,613	24,640	25,666
3	17,600	23,466	24,639	25,813	26,986	28,159	29,332
2	19,800	26,400	.....	29,040	30,360	31,680	33,000
1	22,000	29,333	.....	32,266	33,733	35,200	36,666
0	27,500	36,667	.....	40,344	42,167	44,000	45,834
00	33,000	44,000	.....	.....	50,600	52,800	55,000
000	38,500	51,333	.....	.....	59,033	61,600	64,166
0000	49,500	66,000	.....	.....	75,900	79,200	82,500
Circ.mils							
250,000	52,800	70,400	.....	.....	.....	84,480	88,000
300,000	60,500	73,330	.....	.....	.....	87,996	91,662
350,000	66,000	88,000	.....	.....	.....	105,600	110,000
400,000	71,500	95,333	.....	.....	.....	.....	119,166
500,000	88,000	117,333	.....	.....	.....	.....	146,666
600,000	99,000	132,000	.....	.....	.....	.....	165,000

The above table may be used to determine size of mains for apartment buildings, as provided for in Rule 807 of the Electrical Code of the Department of Gas and Electricity of the city of Chicago. All lights in public halls, basements, etc., are allowed for on a basis of 40 watts per lamp. On a basis of 0.75 watt per square foot for mains, this would be the equivalent of 53 sq.ft. of floor space per lamp. Example: What size mains are required for twelve apartments of 1,200 sq.ft. each with ten lamps in halls, basements, etc.? 12 × 1,200 = 14,400 sq.ft. Ten lamps at 53 sq.ft. per lamp = 530 sq.ft., or a total of 14,930 sq.ft. to be provided for. In the column headed "11 to 15 apartments" it will be found that a No. 6 wire is necessary.

British Business Improving

British business men and the British trade papers are now admitting that the commercial and industrial outlook for England is distinctly better, according to N. W. Mitchell, trade commissioner of the United States Department of Commerce at London, who has just returned to the United States after three years in England. Mr. Mitchell said that it is only in the last few weeks, when the physical proofs of improving conditions have accumulated on every side, that the conservatism of the business world has allowed it to see, or at least to admit, the light ahead. Further, he said that the present improvement and the improvement for some time to come will be only relative and that much ground must be gained before conditions will be even normal, for the slump has been extremely severe; but the bottom is certainly past and the movement is distinctly upward.

Systematic Collection of Statistics

First Step in Elimination of Immense Wastes Is Report Made to National Distribution Conference—Advertising an Aid to Economic Distribution

THAT trade associations carry on the work of collecting data on distribution in their respective industries and the collective study of the elimination of waste is one of the recommendations made this week by a committee of government officials and business executives, of which Owen D. Young is chairman, to the National Distribution Conference at its meeting held under the auspices of the Chamber of Commerce of the United States at Washington. In the report it is pointed out that there is need of the systematic collection of statistics as a first step in the elimination of immense wastes in distribution owing to wide market fluctuations.

Secretary Hoover, who selected the members of the committee at the request of the conference, said, in outlining its purposes: "We are almost wholly lacking in the basic data as to distribution. It is my hope that this committee may sponsor and direct a broad inquiry into the business statistics now available and into the needs of the various branches of industry in the collection of additional figures, and make recommendations as to the best methods, public and private, of obtaining a more accurate knowledge of the marketing areas, and so approach more intelligently a discussion of wastes in distribution."

In addition to the recommendation of the committee listed above, some of the other recommendations are: That an exhaustive study be made of present sources of statistics on distribution; that an interdepartmental committee be organized to co-ordinate the work of government agencies publishing statistical summaries covering distribution; that the specialists in organizations, both public and private, engaged in the collection and interpretation of business figures undertake collectively the standardization, simplification and improvement of statistics of this kind; that business men, both as individuals and as members of their trade groups, give serious consideration to the need for a census of distribution comparable to the Census of Manufactures.

"It seems to us," the committee says, "that the ideal would be to have statistics vital to the industries on the one hand, in terms of intimate information, and vital to all our people in terms of economic surveys, flowing as a stream from its many sources and many branches to a common pool of ordered knowledge, there mobilized for economic consideration of the country as a whole, and in turn flowing back to industry in terms of a composite picture of the ebb

and flow of trade. When we analyze the confusion we recognize that it follows partly from a lack of a common nomenclature, that it has partly grown up because individual agencies have grown up without regard to each other, and that the primary present need is to develop through co-operation a systematic and ordered approach to this whole subject, so that statistics will be of use for primary purposes for which they are collected in the trade associations, and that these narrow currents of basic information will merge as a wide current, not only for the common good but for the individual good of each of the contributing streams."

Any doubt that might have existed as to the legality of the collection of such statistics by trade associations, the committee holds, has been cleared away by recent decisions of the United States Supreme Court. "Business statistics," the committee concludes, "are the only effective guide to balanced production and distribution. They are the only means for co-ordinating demand with production and uninterrupted employment. Their results would be felt by every human being in the country from the individual owner of the largest factory down to the humblest workman of the field."

Advertising Discussed

To advertising was also given a prominent place in the economy of marketing in a survey of "Market Analysis, Advertising and Advertising Mediums" at the general meeting of the National Distribution Conference. The special committee which made the survey, consisting of business men, economists and advertising experts, finds that national advertising is a contributing factor in the reduction of marketing costs and, indirectly, in the reduction of prices.

This conclusion is based on first-hand testimony from a large number of distributors as to the economic effects of advertising. The committee lists the advantageous effects of proper advertising as: Decreasing the cost of selling, lowering the cost of production on account of increased volume, lowering prices to consumers and thereby raising the standard of living, and, as a by-product, aiding in the education of the general public. The committee finds, however, as a result of its investigations, that there are large wastes in advertising "due to the inadequate or uninformed study of markets and to the imperfect co-ordination of advertising with other activities." Various steps, among them the establishment of a market research planning body, designed to place advertising upon a more scientific basis are proposed in its report.

"As a result of its studies," the report concludes, "your committee reports that there is a decided value to advertising in economic distribution. It does pay to advertise the right goods in the right media and in the right way. The superficial talk to the effect that advertising pays has made advertising too haphazard, while the lack of exact data has been a matter of distinct disadvantage to those who desired to study the problem before making their advertising appropriations or deciding upon how those appropriations should be spent. The advertising successes are such as to encourage greatly its further use. There are large wastes in advertising, but at present it seems beyond the power of this committee to get any exact data regarding such waste. Such information as is available, however, would indicate that properly planned and placed advertising has genuine economic value, not only for the user of such advertising by reason of its aid to him in distribution, but it is of genuine value to the public itself, because the public to a large extent shares in the economies which it brings about."

Selling Electric Refrigeration

Idea of Good Refrigeration Should Be Imparted to Public First, That of Electric Operation Next—All Interested Can Co-operate to Advantage—Central Station's Part

By a Refrigerator Manufacturer

IT DOES not seem at all necessary that any drastic changes be made in the present high-class refrigerator construction in order to render it adaptable to electric refrigeration, and the advisability of establishing a standard refrigerator—that is, with respect to size and form—is seriously questioned. Manufacturers would be more than pleased if only one style were in demand, but, despite the fact that every effort is made to keep the line as simple as possible, they are obliged, because of the various tastes of the public and the definite but non-uniform space allowed for refrigerators in homes, to produce about fifty different sizes and styles of refrigerators. Any one of these is adaptable to electrical refrigeration without material change. The prime necessity is that scientifically constructed refrigerators should be used at all times, either with ice or electrical refrigeration, and that this should be particularly insisted upon by mechanical-refrigeration manufacturers and the dealers through whom their products are distributed.

A study of this problem would reveal that the idea of good refrigeration must be imparted to the public first and that of electric operation next. The first task should be backed not only by refrigerator manufacturers, electric refrigeration-unit manufacturers and electric utilities, but by ice companies as well. The latter have been worrying about the inroads upon their business by electric refrigeration, but if they can be shown that this plan will help their business by stimulating the use of more refrigerators in more homes, they will give increasing help to the electric refrigeration idea, in which utilities, the electric refrigeration-unit manufacturers and refrigerator manufacturers are particularly interested. The policy indorsed at the recent convention of the National Association of Ice Industries at Los Angeles to launch an intensive campaign to educate the public to use more household refrigeration is in the right direction. Co-operation of the ice manufacturers with the N. E. L. A. on a plan which, it is believed, is now being worked out, will be beneficial to everybody concerned.

The electric refrigerator is acknowledged to be the greatest revenue producer for central-station companies that has been placed on the market for some time. Granting this, an almost unlimited amount of assistance can be rendered by these companies in placing the refrigerator before the public. This can be done by widespread publicity. Some electric companies have started a scheme of advertising, applying the amount of money it costs to connect a new residence with the street lines to a fund for newspaper announcements covering every electric refrigerator that goes into a home already wired. This is a good start, but I believe they can afford to go much further and spend considerable money, not only in local advertising, but collectively in national publications in order to further this new application.

Business in 1926

Ayres Forecasts Continued Prosperity During Major Part of Year with Peak in Late Summer

"THE coming year is one in which business will reach the peak of prosperity, probably in the summer," Col. Leonard P. Ayres, vice-president of the Cleveland Trust Company, declared in an address before the Cleveland Chamber of Commerce on December 15. "In the summer a turn-down is expected," he said, "but the major part of the year promises to be one of pronounced prosperity, and if the culmination comes in the late summer, the following decline probably will be gradual at the outset, rather than sudden. The most important single fact about business is that prosperity is here. The most important question is how long it will last. Wages are high and advancing, employment is large and expanding, the cost of living has increased less rapidly than wages, and agriculture has had a good year.

"It is entirely probable that profits of 1925 will be larger than those of any previous peace-time year in the history of American business. There can be no real doubt that general business will be very good during the remainder of the year. There is equally little doubt that good business will prevail during the early months of 1926. There appears no genuine reason for doubting whether business can continue to be equally good during all of next year." Colonel Ayres declared that during the past four years there has been under way in this country the greatest building boom that there has ever been experienced in any land at

any time, and this period of prosperity has been largely based on the extraordinary building program. The figures for construction in 1925 will be far greater than for any previous year, but he said that some time in the future building must slow down. He said the enormous production figures in the automobile industry of the past two months make it nearly certain that the total output in 1925 will be well in excess of that of any previous year. These figures, he said, suggest the possibility of overproduction in 1926.

Colonel Ayres declared that financing companies engaged in extending credit to retail purchasers are now vigorously competing for business and that the spread of installment selling will ultimately be checked. Turning to a specific forecast for 1926, Colonel Ayres said that it seems probable that the general trend of interest rates will be slowly upward, and if this comes to pass it is likely that the prices of investment bonds will decline gradually during the year, reach a turning point before the end of the year and start upward once more.

November Building Record

Contracts for 1924 Exceeded by 19 per Cent in Eleven Months of 1925 —Increases Everywhere

RECORD building volume is continuing into the winter months, according to the November records of the F. W. Dodge Corporation. Building and engineering contracts awarded last month in the thirty-six Eastern States, which include about seven-eighths of the total construction volume of the country, amounted to $464,683,100. This is the highest recorded figure for any November and is 23 per cent greater than the amount recorded in November of last year. There was a seasonal decrease of nearly 11 per cent from October. The strongest influence now holding the building volume up to record proportions is the big increase in New York City activity, largely speculative in character. The November record included the following important items: $240,279,800, or 52 per cent of all construction, for residential buildings; $61,336,000, or 13 per cent, for commercial buildings; $57,035,300, or 12 per cent, for public works and utilities; $53,308,600, or 11 per cent, for industrial buildings, and $22,048,100, or 5 per cent, for educational buildings.

New construction started in the thirty-six states during the past eleven months has reached the record-breaking total of $5,310,950,000, compared with $4,151,321,100 in the first eleven months of last year and with $4,479,307,000 in the entire twelve months of last year. The percentage increase over the corresponding period of last year is 28 per cent; over all of last year, nearly 19 per cent. Every district has in eleven months exceeded its 1924 total, some districts by very large percentages. Contemplated new work reported for the thirty-six states in November amounted to $698,272,700, which is 17 per cent less than in October and 35 per cent greater than the amount reported in November of last year.

Business Conditions

THE general tendency is for business to fall off during the rest of the month, manufacturers reporting that although many inquiries are being received for quotations, the attitude is to delay purchasing until after the first of the year. Market conditions are sound, and the feeling among electrical men is that business will continue good well into next year. Central-station companies, particularly the larger ones, are buying in steady volume, small industrial plant purchasing has decreased, machine-tool manufacturers continue to place good orders, and a large export order for switching equipment for South America was reported.

A manufacturer of pulverized coal equipment states that the inquiries he is receiving for quotations indicate a greater volume of business for 1926. The report of the United States Steel Corporation, issued last week, shows an increase of 472,597 tons in unfilled orders on its books on November 30. Production at the steel mills is above the average of the last six years, and it is believed that forward business will steadily increase in the next few months.

In New England there has been a general slowing down in business, although manufacturers of special equipment, such as welding apparatus, report increasing sales. The demand for central-station supplies and plant equipment is steady but does not include any outstanding orders. Inquiries in the New York district presage good sales to industrial plants early in the year, but current buying has decreased. The larger central-station companies have been in the market for material, a good order for switching equipment having been placed as well as an order including $225,000 worth of miscellaneous substation material. In the Southeast the volume of business is holding up. A number of satisfactory contracts for the electrification of textile plants have been closed, and there are several other electrification plans projected. Pole-line-construction work has fallen off considerably in the Middle West, where a large volume of business is being transacted, and there are prospects for continued good sales next year. On the Pacific Coast steam-railroad and power companies are placing large orders for line-construction material, and sixteen substation transformers, aggregating 66,000 kva., were also purchased by a central-station company.

Less Activity in Copper, but Price Is Firm

SALES of copper have been in much less volume, but producers seem satisfied and have not cut prices further. In fact, most quotations reflect a slight advance. Lead and zinc have sold in fair volume at virtually unchanged prices. London prices of tin declined, which induced buying here, but not sufficient to absorb all the offers. The extremely large buying of copper last week seems to have removed most of the pressure from the market, and no effort has been made to sell below the 14-cent, delivered, level. In fact, the price today, as quoted by practically all producers, is 14¼ cents for Eastern deliveries.

The lead market shows little change from last week. The contract price of the American Smelting & Refining Company continues at 9¼ cents, New York, and offers are fairly free from most sellers at that level, though there is not a great amount of December lead still to be sold. Consumers throughout the country show little interest in buying for shipment later than December, even at concessions, evidently feeling that the price is more likely to go down than up, though fundamental conditions are so good in the lead industry that no important decline is to be expected; certainly not in January, a month in which the trend, in recent years at least, has been upward. The unusual range between the price of spot and forward zinc has continued or even increased. Tin prices have declined 2 cents, following the lead of London, and buying in the last two or three days has improved.

NEW YORK METAL MARKET PRICES

	Dec 9, 1925 Cents per Pound	Dec. 16, 1925 Cents per Pound
Copper, electrolytic	14	14.05
Lead, Am. S. & R. price	9¼	9¼
Antimony	20	21½
Nickel, ingot	34	34
Zinc, spot	9.075	8.85
Tin, Straits	63¼	61¼
Aluminum, 99 per cent	29	29

Base copper price Dec. 16, 1925, 16¾ cents

Special Electric Equipment Sales Increasing in New England

WITH a general slowing down in the purchasing trend marking the electric supply and equipment business throughout the New England territory, there have been on the other hand, a few outstanding records of special interest. It is reported by manufacturers of electric welding apparatus and electric recording instruments that not only have the fields of uses widened appreciably and, accordingly, reflected an increasing movement in these special types of equipment but inquiries and negotiations under way point to much activity during the coming year.

The demand for central-station supplies and plant equipment, though still steady, is not featured by any outstanding bookings; but from inquiries received a noticeable trend in higher-voltage apparatus indicates that many plans are under way for replacements and for the installation of additional equipment. New construction supplies are selling in less volume, though one prominent jobber reports a strong demand for conduit. Wiring devices, wire, fixtures and hardware sales are spotty; power equipment demands are light. Household electric appliances are more active, though reports from both manufacturers and jobbers indi-

cate a backward season in buying up to the present week. One group, consisting of fourteen central-station companies, reports an increase in sales of appliances to date amounting to about 27 per cent as compared with the same period in 1924.

Volume of Business Holding Up in the Southeast

THE volume of business reported from all sections of the Southeast shows no signs of decreasing, and a number of territories heretofore not taking their normal amount of materials are showing improvement. The only sections not now up to the ordinary volume of business are north Georgia and parts of South Carolina, which were hard hit by the drought this fall. Considerable activity in industrial lines is reported, and a number of satisfactory contracts for the electrification of textile plants have been closed recently by Atlanta firms. There are several other electrification jobs in prospect that will probably be closed within the next thirty days. Jobbers are well pleased with the business done in Christmas specialties and indications are that there will be no carry-over in this line.

Line construction materials are in brisk demand, orders coming in from the entire section. Indications are that stocks are being depleted, as pole and cross-arm deliveries are reported on a four to six weeks basis and deliveries of hardware have slowed up somewhat. Commercial-lighting fixtures are in good demand and purchases of and inquiries regarding industrial-lighting equipment are very satisfactory. Residential lighting-fixture business has been slow of late. Several South Georgia central-station companies not heretofore in the merchandising game will enter the field on the first of the year, and they are placing good orders for the delivery of electrical merchandise immediately following the first of the new year. Kitchen-lighting and other similar campaigns will be undertaken in the spring by these companies.

Inquiries in New York District Presage Increasing Business

INQUIRIES in the New York district are in good volume and presage increasing business, but it is evident that buyers are not eager to place orders until after the first of the year. Current small orders from industrial plants have decreased somewhat. Central-station buying continues in steady volume, a large order placed this week calling for about $225,000 worth of miscellaneous substation material. The demand for transformers is fair and includes about 50,000 kva. that will very likely be purchased before the end of the month.

Orders were placed this week for 6,000 kva. of the distribution type by a utility company for use in a new plant now under construction, following the purchase of 12,000-kva. power-type transformers about four weeks ago. Much miscellaneous material was also purchased for use in this new plant. A good order for switching equipment was placed by a central-station company, and such business from the larger companies is reported good. Pole-line hardware sales have slackened off, owing mainly to the fact that most companies have covered their requirements for the first part of next year, following the recent stiffening in steel. Jobbers also report a slight decrease in sales, but indicate that total sales for the year will be well ahead of last year.

Line Construction Decreases in Middle West—Business Good

CONTINUED good business is reported from all sections of the Middle West. The volume is apparently increasing, and the consensus of opinion is that 1926 will be an excellent year. Construction work has fallen off considerably with the colder weather, although work in progress is being rushed to completion. Considerable appliance business is being contracted for at this time by the various utility companies.

Among the interesting orders placed were the following: Four 15,000-kva., 142,000-volt transformers; 700 current transformers; 110 direct-current watt-hour meters and incandescent lamps valued in excess of $500,000. Jobbers' sales are excellent. Appliances are moving exceptionally well, as are also portable lamps. Quite an active demand has been noted for motors and switches

Power Companies and Railroads Buying Well on Pacific Coast

SOME exceptionally large orders and inquiries have been received from steam railroad and power companies on the Pacific Coast. Railroad business, actual and immediately prospective, includes 550 miles of No. 6 and 200 miles of No. 9 "BB" iron wire, 50,000 steel pins and 3,000 sets 28-in. cross-arm braces complete with necessary bolts. Power-company buying covers much line-construction material and includes 500 poles from 50 ft. to 60 ft. for January delivery and 4,500 poles for March and April delivery, the bulk of these last being 7-in. top and 35 ft. long. The San Joaquin Light & Power Corporation has purchased sixteen substation transformers aggregating 66,000 kva. Radiator sales to date have run only about two-thirds as much as last year, and the bulk of these are almost untouched on the dealers' shelves, but the cold snap of the past week has created a better movement. Appliance sales are just beginning to reflect the holiday demand; waffle iron sales have doubled over last season, the demand for washers is quiet and vacuum-cleaner sales are fair to good.

Activities of the Trade

Truscon Steel Offers Line of Hardware and Specialties

A complete line of Truscon hardware and specialties, hot-galvanized, double-dipped, for both wooden poles and steel poles, has been offered to the trade by the Truscon Steel Company, Youngstown, Ohio. Truscon pole-line hardware and specialties are said to conform in every respect to N. E. L. A. and A. T. & T. standards. In offering this line the company has assured prompt emergency service through its twenty warehouses located throughout the country.

Hurley Machine Proposes Change in Name and Stock Increase

At a recent meeting of the board of directors of the Hurley Machine Company, Chicago, manufacturer of washing machines, ironing machines and vacuum cleaners, a recommendation was made to the stockholders that the name of the company be changed to the Electric Household Utilities Corporation and that the capital stock be changed from 300,000 shares of no par value to 600,000 shares having a par value of $10. The stockholders of the company will vote on the above changes on December 28.

For many months the company has been engaged in designing and experimental work on a new domestic electric refrigerator which has since been developed, and the company now plans to engage in the manufacture and sale of this equipment as well as to enlarge its present merchandising activities in the electric household appliance field. The directors believe that the new name will more appropriately designate the character of the business which the company is now doing and which it proposes to do in the future. There will be no change in the policies of the company or in its management.

Kelvinator, Nizer and Grand Rapids Refrigerator to Combine

The Kelvinator Corporation and the Nizer Corporation, both of Detroit, and the Grand Rapids Refrigerator Company, Grand Rapids, Mich., will combine to form a corporation to be known as the Electric Refrigeration Corporation with headquarters at Detroit. The assets of the new corporation will, it is said, be in excess of $10,000,000.

It is understood that Kelvinator and Nizer will exchange share for share into the stock of the new company and that Grand Rapids will be taken over for a cash consideration of approximately $6,000,000. An issue of Electric Refrigeration debentures will be placed on the market in a few days. Details of the capitalization will be ready for announcement at that time. According to the bankers this merger will enable Kelvinator and Nizer to obtain control of the Grand Rapids company, which manufactures the refrigerator cabinet.

Takata & Company Ltd., Tokio, Japan, has been inaugurated to conduct the business formerly carried on

by the firm of Takata & Company. The new corporation is absolutely independent of the assets and liabilities of the insolvent firm of Takata & Company and was initiated not only with a view of preserving internationally the name and credit of Takata & Company, but also to assist voluntarily in reimbursing the creditors of the insolvent firm. The new company states that J. N. Murray, who has been actively associated for many years with the old firm's New York office, has been appointed its representative in America, with offices at Room 715, Westinghouse Building, 150 Broadway, New York.

General Electric Acquires 155-Acre Site in St. Louis

Gerard Swope, president of the General Electric Company, has announced that the company has definitely decided to purchase a site for a manufacturing establishment in the city of St. Louis. The tracts of real estate selected contain in the aggregate about 155 acres, of which all but 11 acres are within the city limits of St. Louis. The property in general lies between the belt line of the Terminal Railroad Association and Goodfellow Avenue and has frontage on Bircher Avenue.

"The exact date on which construction will commence has not been determined, and it will depend, of course, upon the future growth and development of the business of the General Electric Company," Mr. Swope said. "It has not been decided what character of apparatus will be manufactured in St. Louis. The company has carefully and thoroughly considered the advantages of locating a manufacturing branch in St. Louis and has satisfied itself that conditions there are excellent. The rapid growth of the use of electricity in this section of the country justified the location of a manufacturing property in St. Louis on account of its unexcelled position as a distributing point."

The Public Service Production Company, Newark, N. J., has received a contract for the installation of approximately 360,000 ft. of underground cable in Detroit for the municipal light and street-railway service.

The Maytag Company, Newton, Iowa, manufacturer of washing machines, has let contracts for the construction of a foundry building addition, which will have a capacity of 75 tons of castings daily, providing parts for 1,600 washing machines, representing a 100 per cent increase in the plant's output. The company will soon occupy the new six-story machine shop building built during the summer.

The Jeffery-Dewitt Insulator Company, Kenova, W. Va., and the **Champion Switch Company**, Buffalo, N. Y., announce the appointment of the following sales representatives: the W. C. Fletcher Company for Indiana, with headquarters at Indianapolis; A. F. Krippner for Colorado, with headquarters at Denver, and L. J. Osborne & Company for Kansas, with offices at Kansas City, Mo.

The Hastings Electric Sales Company, 42 Binford Street, South Boston, Mass., announces that the company will hereafter be known as the Hastings-Pettingell Sales Company and that R. V. Pettingell, formerly president of the R. V. Pettingell Electric Supply Company of 51 High Street, Boston, has sold out his entire interest in that company and is now associated with the Hastings-Pettingell Sales Company as treasurer. C. A. Hastings is president of the company, which acts as factory representative for a number of manufacturers and maintains a warehouse carrying a large stock. Some of the manufacturers represented are the Philadelphia Electric Conduit Manufacturing Company, the Trumbull-Vanderpoel Electric Manufacturing Company, the Roach-Appleton Manufacturing Company, the Carbon Products Company, the Adapti Company, the Chelsea Radio Company, the Boudette Manufacturing Company, the Murad Corporation of New Jersey and J. B. Hauer, Inc.

Roth Brothers & Company, 1400 West Adams Street, Chicago, manufacturer of motors, generators, battery-charging sets, etc., announces that Max L. Robinson, for several years specialty sales manager in the Chicago office, has been appointed sales manager of the company. Mr. Robinson was previously, for a number of years, with the Century Electric Company and the Cutler-Hammer Manufacturing Company, representing those companies in the Kansas City territory.

The Kellogg Switchboard & Supply Company, 1066 West Adams Street, Chicago, manufacturer of telephone systems and apparatus, announces that A. D. Beal will now have charge of advertising, superseding E. I. Pratt, who has resigned to become associated with the Bryant Electric Company, Bridgeport, Conn.

The Allis-Chalmers Manufacturing Company, Milwaukee, announces that C. E. Phillips has been appointed representative in charge of the Wilkes-Barre (Pa.) office, succeeding Guy V. Woody. Mr. Phillips was formerly connected with the Philadelphia office of the company.

The Western Electric Company has announced the appointment of E. P. McGrath as sales manager of its Brooklyn supply house. Mr. McGrath succeeds W. D. Koch, who was transferred to the sales department of the Boston supply house.

The Bridgeport Brass Company, Bridgeport, Conn., has appointed A. H. Watkins metropolitan district sales manager, with offices in the Pershing Square Building, New York City.

The Chicago Fuse Manufacturing Company, Laflin and Fifteenth Streets, Chicago, has announced the appointment of Lowell C. Noyes as district sales manager for Chicago. Mr. Noyes will be stationed at the company's general offices and factory in Chicago. He was formerly a sales engineer with the company.

Pass & Seymour, Inc., Solvay Station, Syracuse, N. Y., has placed on the market a new bracket-type porcelain receptacle for use as a side wall bracket with flush boxes. Two styles are made—the P. & S. 844 with porcelain ring for ball lamps and the P. & S. 845 with porcelain shade holder for bracket glassware.

The United States Rubber Company, 1790 Broadway, New York, announces that Herbert E. Smith, formerly general sales manager, has been elected a second vice-president of the company in general charge of sales activities of all commodities except tires, succeeding George H. Mayo, who has retired.

New Equipment Available

Flexible Coupling

The Poole flexible coupling, consisting of six parts, two hubs having an external gear on each, meshing with internal gears in two sleeves which are bolted together, and two aligning rings which are fitted in the two sleeves, has been placed on the market by the Poole Engineering & Machine Company, Baltimore. The outer faces of the teeth on the hubs are formed spherically, which is said to provide a self-aligning bearing for the connecting sleeve. The coupling is of the all-metal gear type, lubricated and self-aligning without binding action. When assembled complete protection is provided against dust and dirt.

Weatherproof Magnetic Switch

A special form of the type CR-7009 magnetic switch has been placed on the market by the General Electric Company and is provided with a weatherproof inclosing case and roof for use in valve-control service, where operating conditions require that the switch be installed in an exposed place, or in other similar conditions where it is necessary or desirable to locate the control nearer the motor. All seams and supports of the outside case are turned, to eliminate surfaces where water might collect. The roof is slanting and overhangs the case on all sides to allow water to fall away. The case itself is provided with a special finish to meet the service conditions, and a new latch is furnished for the door.

Water Tester.—A new conductivity tube as well as a different form of self-contained direct-current generator, similar to the "Super-Meg" insulation tester, are improvements to the "Dionic" water tester placed on the market by James G. Biddle, 1211 Arch Street, Philadelphia. The new generator used is a lighter and less expensive form of megger developed about two years ago. It is said that this tester will measure amounts of salt in solution too small to be detected by chemical means, doing this in a few seconds with an unskilled operator. This instrument is also available in the recording type.

New Trade Literature

ELECTRIC FURNACES.—Bulletin No. 1,125 issued by the Vom Baur Engineering Corporation, Woolworth Building, New York City, covers its electric furnaces for melting and refining steel, gray iron, malleable and ferro-manganese. It contains a sketch on the design of the Vom Baur electric furnace and illustrations showing various applications of the furnace. In addition to furnaces for use for purposes enumerated in this bulletin the company calls attention to its furnaces for the direct smelting and reduction of ores.

ENGINES, OIL DRILLING AND PORTABLE POWER HOUSES. — The Climax Engineering Company, Clinton, Iowa, has issued a series of bulletins covering various types of the Climax engines, oil-drilling equipment, portable power houses, etc.

CREOSOTED YELLOW-PINE POLES.—"Sentinels of Service" is the title of a booklet issued by the Long-Bell Lumber Company, Kansas City, Mo., which describes and illustrates the Long-Bell creosoted yellow-pine poles for telephone, telegraph and power-line construction and maintenance. It contains many illustrations showing the treatment of the poles from the forest to the service point, the treating plants at Shreveport and De Ridder, La., and photographs of transmission lines where the poles are in use.

STEAM TURBINES.—Bulletin No. GEA-235 issued by the General Electric Company, Schenectady, N. Y., describes the General Electric five-stage, 60-cycle steam turbines, with ratings of 500, 600 and 750 kw. at 3,600 r.p.m. The general principles and advantages of steam turbines are discussed and sections and steam-path diagrams are shown. Illustrations are also given showing various installations of the turbines.

BALL BEARINGS. — "The Burden Bearers" is the title of a booklet issued by the Standard Steel & Bearings, Inc., Plainfield, Conn., in which it describes the method of forging the "SRB" molybdenum steel balls.

TRANSMISSION MACHINERY.—Catalog No. 22 issued by Winfield H. Smith, Springville, N. Y., entitled "A Guide Book of Speed-Reducing Gears and Light Transmission Machinery," covers its line of light power-transmission machinery. The catalog contains tables for easily selecting the speed-reducing gear suitable for any application.

FLEXIBLE BELT DRIVE.—Bulletin No. 1,228-A issued by the Allis-Chalmers Manufacturing Company, Milwaukee, covers the Allis "Texrope" drive, a flexible and positive multiple-belt drive for close centers. This bulletin contains photographs and descriptions of additional applications not shown in bulletin 1,228, previously issued.

SWITCHBOARD INSTRUMENTS.—The Vol. 2, No. 3, issue of the *Jewel Magnet*, the house organ of the Jewell Electrical Instrument Company, 1640 Walnut Street, Chicago, has been devoted to the description and illustration of the company's line of rectangular switchboard instruments and is offered as a catalog supplement. Illustrations, wiring diagrams, outline dimensions, typical scales and complete information on Jewell rectangular instruments are included.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number.

Purchase or agency is desired in Cannstatt, Germany (No. 18,240), for electric lighting sets for automobiles.

An agency is desired in Coburg, Germany (No. 18,188), for electrical appliances and supplies and radio supplies.

Sole agency is desired in Cape Town, South Africa (No. 18,189), for electric cooking appliances, hot-water geysers, flatirons, lamps, etc.

An agency is desired in The Hague, Netherlands (No. 18,193), for electrical equipment and appliances.

Purchase and agency is desired in Birmingham, England (No. 18,191), for electrical novelties and radio sets and parts.

An agency is desired in Brussels, Belgium (No. 18,171), for electric exhaust fans, call systems and storage-battery trucks, ventilating equipment, air meters, humidifiers, and filters.

Purchase is desired in Montevideo, Uruguay (No. 18,194), for 23,520 electric meters for alternating current; and 520 meters for direct current (No. 18,187).

An agency is desired in Nuremberg, Germany (No. 18,190), for radio sets and parts.

Purchase is desired in Ghent, Belgium (No. 18,192), for radio supplies.

Purchase is desired in Guayaquil, Ecuador (No. 18,283), for X-ray apparatus.

Purchase is desired in Melbourne, Australia (No. 18,169), for two complete sets of mechanical coal-handling apparatus.

ELECTRIC EQUIPMENT FOR SUGARLOAF-RUBICON (AUSTRALIA) POWER SCHEME.—Specifications have been issued by the State Electricity Commission of Victoria, Melbourne, Australia, according to *Commerce Reports*, inviting bids (until April 12, 1926) for seven turbo-generators, twenty-nine transformers, switchgear and other equipment needed for the Sugarloaf-Rubicon hydro-electric scheme. Copies of the specifications are on sale in the New York and Chicago district offices of the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C.

ELECTRIC METERS FOR MONTEVIDEO, URUGUAY.—Bids will be received by the Administracion General de las Usinas Electricas del Estado of Montevideo, Uruguay, until Jan. 25, 1926, according to *Commerce Reports*, for 23,520 alternating-current watt-hour meters, and 520 direct-current watt-hour meters. Specifications in Spanish may be obtained from the Electrical Equipment Division, Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., by referring to No. 190,220 and No. 190,219 respectively.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

OLD ORCHARD, ME.—The Selectmen are negotiating with the Cumberland County Power & Light Company for the installation of an ornamental lighting system on Old Orchard Street.

NASHUA, N. H. — The Manchester (N. H.) Traction, Light & Power Company has acquired a site on Main Street, on which it proposes to build a large office building, to look after its southern New Hampshire business.

NEW HAVEN, CONN.—The installation of an interlocking traffic signal system, to cost about $25,000, is under consideration by the City Council.

Middle Atlantic States

AUBURN, N. Y.—Plans are being considered to replace the present steam-driven pumping plant at the municipal waterworks with electrically-operated pumps. The cost is estimated at $20,000. The installation of an electrically-operated street traffic signal system in the business district is under consideration.

BROOKLYN, N. Y. — Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until December 29, for sixty-five bracket and desk fans for the Brooklyn, Philadelphia and Norfolk navy yards (Schedule 4793).

BROOKLYN, N. Y. — The American Sugar Refining Company, 117 Wall Street, New York, plans to install electric power equipment in connection with extensions at its refining plant on South Second Street, to cost about $2,000,000.

CANADEA, N. Y.—Plans are under way by the Rochester Gas & Electric Company to construct a hydro-electric project on the Genesee River at Canadea, to cost about $2,000,000. The work will be carried on by the Canadea Power Company, a subsidiary company.

ELMIRA, N. Y.—The City Council contemplates extensions to the street-lighting system, covering twenty streets.

GOVERNORS ISLAND, N. Y. — Bids will be received by the Signal Corps, Procurement District, Governors Island, until December 22, for 100 voltage regulators (Circular 15).

HUDSON FALLS, N. Y.—The installation of an ornamental lighting system in the business district is under consideration by the Board of Trustees.

JORDAN, N. Y.—Permission has been granted the Jordan Electric Light & Power Company to serve additional portions of the towns of Elbridge, Camillus and the town of Van Buren. Four extensions will be required to cover the service.

NEW YORK, N. Y.—The New York Edison Company has filed plans for extensions in its substation at 128-30 East 121st Street, to cost about $25,000.

NEWARK, N. J. — The Sheffield Farms Company, 524 West Fifty-seventh Street, New York, plans to install electric power equipment at its proposed milk pasturizing plant at Frelinghuysen Avenue and Empire Street, to cost about $1,500,000.

PATERSON, N. J.—The installation of thirty additional lamps on Main Street between Crooks Avenue and the Erie Railroad in South Paterson has been approved by the City Commissioners.

RAHWAY, N. J.—Extensions and improvements to the municipal waterworks, including pumping machinery, etc., to cost about $163,000, is under consideration by the Board of Water Commissioners.

EASTON, PA.—The New Jersey Power & Light Company, Dover, N. J., plans extensions in its transmission system along the Delaware River in this vicinity, to connect with the lines of the Eastern Pennsylvania Power Company, recently acquired. The company also contemplates transmission line extensions in the vicinity of Boonton, N. J.

ERIE, PA. — Plans for rebuilding the plant of the Erie Engraving Company, recently destroyed by fire, with a loss of about $90,000, include a power plant.

MEADVILLE, PA. — Extension to the ornamental lighting system throughout the business section, to cost about $20,000, is under consideration by the City Council.

BALTIMORE, MD. — The Consolidated Gas, Electric Light & Power Company has been granted permission to acquire the system of the Freedom District Electric Light Company, and plans extensions in transmission lines in that section.

BARRETT, W. VA.—The W. M. Ritter Lumber Company, Columbus, Ohio, contemplates the installation of electric power equipment at its proposed saw mill and lumber plant in this section, to cost about $200,000.

WASHINGTON, D. C.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, until December 29, for 10,100 flashlights for various yards (Schedule 4795); also for a quantity of electrical supplies for eastern and western yards (Schedule 4810).

North Central States

CHEBOYGAN, MICH. — The Michigan Public Service Company is erecting 80 miles of 33,000-volt transmission line from Elk Rapids to Pellston ,and a 13,200-volt line from Gaylord to Grayling, 31 miles long. The General Engineering & Management Corporation, 165 Broadway, New York City, is supervising the work.

HAMILTON, MICH.—Plans have been approved by the Township Board for a municipal electric plant.

PONTIAC, MICH.—The Oakland Motor Car Company plans to install electric power equipment at its plant, in connection with extensions and improvements, to cost about $3,000,000.

CHILLICOTHE, OHIO.—In connection with the proposed expansion to its local mill the Mead Pulp & Paper Company, Dayton, plans extensions to its power plant to increase the capacity from 5,000 to 7,500 hp., at a cost of about $200,000.

CLEVELAND, OHIO.—Bids will be received at the office of the Commissioner of Purchases and Supplies, City Hall, until Dec. 24, for valves for the Division of Light and Power.

CLEVELAND, OHIO.—Plans are being considered by the City Council for the installation of ornamental lamps on a number of streets, including Carnegie, St. Clair, Lorain, Superior, Clark and Detroit Avenues, and West Twenty-fifth, West Ninth, West Third and West Sixth Streets.

KENTON, OHIO.—The installation of an ornamental lighting system in the uptown district of Kenton has been authorized by the City Council. The plans call for seventy-six standards carrying 200-cp. lamps.

NEWCOMERSTOWN, OHIO. — Plans have been filed by Haller Brothers, Inc., for the erection of a new factory building, including a power house. The cost is estimated at $50,000.

WORTHINGTON, OHIO—Plans are under consideration by the Fayette Grain Company for rebuilding its grain elevator, including power plant, recently destroyed by fire. The cost is estimated at about $50,000.

STURGIS, KY.—Preparations are being made by the West Kentucky Coal Company to erect a transmission line from Burlington to Sturgis.

INDIANAPOLIS, IND. — The Insley Manufacturing Company, Olney and St. Clair Streets, plans to build a new power house at its plant. High-pressure boilers and other equipment will be installed.

AURORA, ILL.—A petition has been filed with the Illinois Commerce Commission by the Public Service Company of Northern Illinois, Chicago for permission to purchase the properties of the Chicago Suburban Power & Light Company, Aurora, which serves, West Chicago, Winfield, Valla Park, Westmore, Wayne and High Lake, etc. If granted permission to acquire the properties, the Public Service Company plans to extend its light and power facilities to these communities, and it also contemplates an immediate large construction program in these places.

CHICAGO, ILL.—The Maremont Manufacturing Company, 916 Wabash Avenue, plans to install electric power equipment at its proposed plant on Ashland Avenue, for the manufacture of automobile bodies, to cost about $200,000.

CHICAGO, ILL. — The Commonwealth Edison Company plans to build a service, repair and equipment storage plant, etc., at West Twenty-second and Throop Streets, to cost about $900,000.

EVANSTON, ILL.—The National Biscuit Company, 85 Ninth Avenue, New York, contemplates building a new power house at its local factory.

ROCKFORD, ILL.—Extensions and improvements are contemplated by the Illinois Bell Telephone Company, including aerial lines, cables, underground conduits, telephones, etc., in Highland, Harlem Avenue and West End Divisions, to cost about $270,000.

CUDAHY, WIS.—Plans have been approved by the City Council for the installation of a new fire-alarm and police signal system.

HUDSON, WIS. — The Willow River Power Company has been authorized to issue capital stock in connection with its proposed plan to carry out certain extensions to its power plant and system, which will include the proposed construction of its so-called Mound plant dam, with necessary transmission lines.

ST. CROIX FALLS, WIS. — Permission has been granted the St. Croix Falls-Wisconsin Improvement Company to make extensions to its system, which will include the construction of three dams and enlarging another in the St. Croix River.

WISCONSIN RAPIDS, WIS.—Plans are under way by the Consolidated Water Power & Paper Company and the Nekoosa-Edwards Paper Company, Port Edwards, to erect a 15,000-volt transmission line between Nekoosa and Wisconsin Rapids to inter-connect their hydroelectric properties.

AITKIN, MINN.—The Minnesota Power & Light Company, Duluth, which is negotiating for the purchase of the local municipal electric plant, plans extensions in its transmission lines in this section.

CROOKSTON, MINN.—The Red River Valley Power Company plans to install additional equipment at its local power plant on Roberts Street.

ST. PAUL, MINN.—The City Council has authorized the installation of traffic signal system on various streets in the city, to cost about $27,000.

ST. PAUL, MINN.—The Great Northern Railway Company has started work on the construction of a tunnel, 7¾ miles long, through the Cascade Mountains, from Scenic on the west to Behrens on the east, to cost about $8,000,000. The cost of the electrification equipment will cost about $2,000,000 more. It is planned to electrify the line, eventually, as far east as Troy, Mont.

VIRGINIA, MINN. — The Minnesota Power & Light Company, Duluth, plans to install additional equipment in its local power plant.

WALTERS, MINN.—The Interstate Company, 327 South La Salle Street, Chicago, contemplates extending its high-tension line to supply electricity here.

CLUTIER, IOWA.—The Iowa Railway & Light Company, Cedar Rapids, plans to change the local system from single to three-phase and install two new transformers.

OTTUMWA, IOWA.—Extensive improvements and extensions are contemplated by the Iowa Southern Utilities Company, Centerville, involving an expenditure of about $500,000. The plan includes the erection of a 66,000-volt transmission line from Ottumwa to Grinnell connecting with Sigourney and Washington. The cost of the new line is estimated at about $250,000, for which a greater part of the material has been purchased. It is proposed to increase the local plant by 50 per cent. Eventually the local plant will be connected with Centerville, Creston and Chariton.

SAC CITY, IOWA—Application has been made to the Board of Supervisors of Sac County by the Sac County Electric Company for a franchise to erect transmission lines on certain highways in Sac County. The proposed line would connect Sac City, Odebolt and Schaller.

LEEPER, MO. — A preliminary permit has been granted to W. H. Meredith, Poplar Bluff, for a hydro-electric project on the Black River at Leeper. Randolph-Perkins Company, 1210 First National Bank Building, Chicago, is engineer.

VANDALIA, MO.—The Farber Fire Brick Company plans to install electric power equipment in connection with the rebuilding of its plant, recently damaged by fire, with loss of about $200,000.

FARGO, N. D.—The City Council plans to extend ornamental lighting system on Broadway. R. T. Jacobuson is city engineer.

NIAGARA, N. D. — The Otter Tail Power Company, Fergus Falls, Minn., plans to erect a high-tension transmission line from Devils Lake to Niagara, connecting Niagara, Gilby, Hoople, Adams, Fairdale, Minot and Fordville.

WILLISTON, N. D. — Application has been filed by the United Power Company, Crosby, for permission to erect a transmission line from Williston to Kenmare.

IROQUOIS, S. D.—Improvements and extensions are contemplated by the Northwestern Public Service Company, Huron, to its local plant.

SIOUX FALLS, S. D. — At an election held recently the proposal to issue $300,000 in bonds for extensions to the municipal electric light plant was defeated.

BEATRICE, NEB.—Officials of the Black Milling Company, Beatrice, have organized a new company, to be known as the Gage County Electric Company, to construct and operate an electric plant and system in this vicinity. Application has been made for permission to issue $500,000 in bonds, to finance the project.

BENKELMAN, NEB.—Steps have been taken by the Chamber of Commerce for an improved lighting system on Main Street.

COLUMBUS, NEB.—Extensions and improvements are contemplated by the Northwestern Public Service Company, Huron, S. D., to its local steam-driven electric plant, including the installation of additional equipment, to cost $100,000.

Southern States

ASHEVILLE, N. C.—The Asheville Supply & Foundry Company, Eagle Street, plans to install electric power equipment in its proposed new plant, to cost about $200,000.

GREENSBORO, N. C.—Extensions to the fire-alarm and police-signal system, to cost about $50,000, are under considerations by the City Council.

KANNAPOLIS, N. C.—The Cannon Manufacturing Company plans to install electric power equipment in connection with proposed additions to its local cotton mills, to cost about $2,000,000.

REIDSVILLE, N. C.—The City Council is considering the installation of an ornamental lighting system in the downtown district.

STAR, N. C. — Plans for the proposed stone crushing plant to be erected by the Sandhill Sand Company, Talbird Siding, include a power plant. Electrically-operated conveying and hoisting equipment will be required.

WILMINGTON, N. C. — The Tidewater Power Company is considering extending its transmission lines to all important places within a 100 miles of Wilmington. Negotiations are under way with the town officials of Beaulaville with a view of extending its service there.

CORDESVILLE, S. C. — The S. M. Parker Lumber Company plans to install electric power equipment in connection with the rebuilding of its local mill recently damaged by fire, with loss of about $200,000.

ATLANTA, GA.—Sears, Roebuck & Company, Arthington and Homan Avenues, Chicago, plan to install electric power equipment in a proposed local storage and distributing plant, to cost $3,000,000. A power house is said to be under consideration.

CULVERTON, GA.—The Moore Lumber Company contemplates installing additional equipment at its power plant.

FITZGERALD, GA. — Bonds to the amount of $90,000 have been issued for improvements to the electric light plant and water works system.

SAVANNAH, GA.—The Southern Fertilizer & Chemical Company, Hutchinson Island, Savannah, is planning to install electric power equipment in connection with the proposed rebuilding of its plant, recently damaged by fire, with loss of about $750,000.

SPARTA, GA. — The Georgia Southern Hydro-Electric Company, which recently acquired the municipal electric plant, plans extensions in its transmission system in this section.

FORT LAUDERDALE, FLA. — The Florida Power & Light Company, Miami Beach, has acquired a site on the New River, near Fort Lauderdale, on which it proposes to build a large steam-driven electric generating plant, to have an ultimate capacity of 100,000 kw. Orders have already been placed for two 25,000-kw. steam turbines, boilers and auxiliary equipment. The station will be equipped to burn either coal or fuel oil.

LAKE ALFRED, FLA.—Plans are being considered for the installation of an ornamental lighting system, to cost about $25,000.

MARIANNA, FLA.—Bonds to the amount of $100,000 have been voted for improvements and extensions to the water and lighting plant and for paving.

OCALA, FLA.—Plans for the proposed local cement mill of the Ocala Portland Cement Company, recently organized, to cost about $500,000, include a power plant.

PENSACOLA, FLA.—Plans for the proposed local shipbuilding plant to be erected by the Pensacola Shipbuilding & Engineering Corporation, recently organized, to cost about $200,000, include a power house.

WILLISTON, FLA. — Bonds to the amount of $150,000 have been issued, of which $50,000 will be used for an electric light plant and waterworks system.

EAST RIDGE, TENN. — The Tennessee Electric Power Company, Chattanooga, is considering extensions to its transmission lines in this section.

ERIN, TENN.—The Commissioners of Houston County have granted the Tennessee Power Company, Chattanooga, a franchise to erect and operate transmission lines in the county.

NASHVILLE, TENN.—The installation of ornamental lamps on seventeen streets in the business district, to cost about $50,000, is under consideration by the City Council.

NASHVILLE, TENN. — The budget adopted by the Nashville Railway & Light Company for next year provides for an expenditure of more than $1,500,000. It includes the installation of a turbo-generator, to cost about $500,000, and an outdoor substation to be erected opposite the First Avenue power house, to cost $100,000. A large part of the sum has been allocated to the railway department.

EARNHEARTS, ARK. — Plans for the proposed local cement mill to be erected by the Missouri Portland Cement Company, Federal Reserve Bank Building, Kansas City, Mo., to cost about $750,000, include a power plant. Earnhearts has not a post office.

ALEXANDRIA, LA.—The City Council is considering extensions and betterments in the municipal electric power plant, including the installation of additional equipment.

CLARKSVILLE, LA.—Steps have been taken by the Kiwanis Club for the installation of an ornamental lighting system in the downtown district. The proposed plans provide for eighty standards, to cost between $15,000 and $20,000.

OKLAHOMA CITY, OKLA. — A new 27,000-hp. generating unit with the necessary condensing equipment and auxiliaries,

together with a 1,000-hp. boiler, designed for burning powdered coal, will be installed at the Horse Lake plant of the Oklahoma Gas & Electric Company, near Harrah, 23 miles east of Oklahoma City. The cost is estimated at $1,250,000.

TISHOMINGO, OKLA. — The Oklahoma Gas & Electric Company, Oklahoma City, plans to install a local electric system and to build a 20-ton ice manufacturing plant, at a cost of about $100,000.

FORT WORTH, TEX.—Steps have been taken by the Interurban Civic League for the installation of street lamps on several streets touching the Forth Worth-Dallas interurban line.

HOUSTON, TEX. — The National Terminals Company, Indianapolis, Ind., represented by A. A. Mudge, 1117 Walker Street, Houston, plans to install electric power equipment in its proposed freight terminals and warehouses, and cold storage plant, to cost about $1,000,000.

VICTORIA, TEX.—Plans are under way by the Victoria Ice & Electric Company for placing its wires and cables underground in the fire district. The cost is estimated at $60,000.

WESLACO, TEX.—Plans are being prepared by the Valley Electric & Ice Company for an addition to its local electric plant, to cost about $70,000.

Pacific and Mountain States

PORTLAND, ORE. — Bids will be received by the City Council until December 23, for the installation of an improved lighting system on portions of Grand Avenue and East Burnside Street. Bids will soon be called for an improved lighting system on twenty blocks in the East Side district. The plans call for 118 standards, to cost about $125,000.

PORTLAND, ORE. — The West Coast Power Company, Gasco Building, has applied for permission to erect a transmission line on the Columbia River highway, from Moffat Creek to Bridal Veil.

CULVER CITY, CAL.—The City Council has approved an ordinance for the installation of ornamental lamps on portions of Oregon, Arizona, Montana and Wyoming Avenues, Midway and Hacienda Streets.

LOS ANGELES, CAL.—The Southern California Edison Company, has appropriated $305,000 for extensions and betterments in its system in the Tulare district, $190,000 for improvements at Delano and vicinity, and $75,000 for work at Lindsay and vicinity.

MODESTO, CAL.—The City Council is considering the installation of ornamental lamps on Tenth Street, between F and K Streets, using concrete standards.

ORANGE, CAL. — The Board of City Trustees is considering the installation of ornamental lamps on North Orange Street, between Chapman and Palm Avenues. C. C. Bonebrake is city engineer.

PACIFIC GROVE, CAL.—At an election held recently the proposal to issue $11,700 in bonds for the installation of an automatic fire alarm system was defeated.

SAN BERNARDINO, CAL. — The City Council has approved plans for the installation of ornamental lamps on portions of Arrowhead Avenue and E Street.

VISALIA, CAL.—The Southern California Edison Company, Los Angeles, is acquiring rights-of-way for its proposed transmission line from the Big Creek district to Los Angeles.

Canada

VANCOUVER, B. C.—The Northwestern Electric Company plans to increase the capacity of its local substation, used for lighting service, from 8,000 to 14,000 kw. The cost is estimated at $45,000.

WINNIPEG, MAN.—The Manitoba Power Company has contracted to supply power to the W. A. D. Mining Syndicate, which plans to erect a mill on the Kitchener property in the Long Lake district. In order to supply the service the power company will erect a transmission line from its plant to the mine, a distance of about 15 miles.

LAKEFIELD, ONT. — Plans are being prepared by Kerry & Chase, engineers, Confederation Life Building, Toronto, for two hydro-electric developments, for the Canada Cement Company, to cost about $250,000. Each unit to consist of dam and power house, etc.

Electrical Patents

Announced by U. S. Patent Office

(Issued November 24, 1925)

1,563,051. REGULATOR FOR INCLOSED ELECTRICAL APPARATUS; E. Thomson, Swampscott, Mass. App. filed Oct. 11, 1923. As inclosed X-ray devices.

1,563,053. THERMOCOUPLE BULB FOR ELECTRICAL MEASURING APPARATUS; J. L. Weatherwax, East Orange, N. J. App. filed May 24, 1921.

1,563,062. AUTOMATIC THERMO-REGULATOR FOR BOILER AND OTHER FURNACES; T. L. Barker, Philadelphia, Pa. App. filed July 11, 1922.

1,563,072. AUTOMATIC SWITCH FOR ELECTRIC CIRCUITS; J. A. Brenneman, Milwaukee, Wis. App. filed Jan. 16, 1923.

1,563,083. ELECTRIC ARC DEVICE; C. A. Halvorson, Jr., Lynn, Mass. App. filed Sept. 27, 1922. Incandescent cathode type.

1,563,084. SYSTEM FOR OPERATING ALTERNATING-CURRENT MOTORS FROM DIRECT-CURRENT SOURCES; J. Harris, Lafayette, Ind. App. filed May 5, 1924.

1,563,105. ELECTRICAL ATTACHMENT PLUG; H. R. Pennington, Chicago, Ill. App. filed April 25, 1923.

1,563,110. ROTOR FOR ELECTRICAL MACHINES; W. Regelein and R. Sameith, Mulheim-on-the-Ruhr, Germany. App. filed Sept. 15, 1924.

1,563,120. SYNCHRONIZING DEVICE; O. C. Traver, Schenectady, N. Y. App. filed July 29, 1922.

1,563,140. ARRANGEMENT FOR CONTROLLING THE DRIVING MOTORS IN HIGH-FREQUENCY MACHINES; G. G. von Arco, Berlin, Germany. App. filed Aug. 3, 1922.

1,563,160. ELECTRIC SWITCH; H. Catlin, Fairfield, Conn. App. filed July 14, 1921. Circuit-selector switch.

1,563,198. ELECTROMECHANICAL DOOR-RELEASING MEANS; E. Ledbetter, St. Louis, Mo. App. filed April 4, 1925.

1,563,211. CONNECTION BLOCK FOR BURNERS OF ELECTRIC RANGES; R. H. MacInnes, Hamilton, Ontario, Canada. App. filed July 6, 1925.

1,563,227. LAMP TESTER; G. H. Riebeth, Minneapolis, Minn. App. filed Sept. 29, 1921.

1,563,234. FLEXIBLE NON-METALLIC ELECTRIC CONDUIT; H. M. Short, Penn Yan, N. Y. App. filed Jan. 30, 1922.

1,563,253. CONNECTOR FOR FIRING EXPLOSIVE CHARGES; N. C. Cotabish, Cleveland, Ohio. App. filed Jan. 4, 1921.

1,563,296. WATER HEATER; D. S. Scarborough, St. Louis, Mo. App. filed Feb. 27, 1925.

(Issued December 1, 1925)

1,563,326. SECRET-COMMUNICATION SYSTEM; R. Brown, East Orange, N. J. App. filed Nov. 8, 1921.

1,563,327. RELAY SYSTEM; Q. A. Brackett, Pittsburgh, Pa. App. filed Jan. 20, 1921. For protecting apparatus from reversals of polarity.

1,563,330. MERCURY-RECTIFIER STARTING DEVICE; E. W. Breisch, Edgewood Park, Pa. App. filed Aug. 17, 1920.

1,563,342. SIGNALING SYSTEM; F. Conrad, Pittsburgh, Pa. App. filed April 1, 1922. Oscillation generator adapted to be excited by alternating current.

1,563,347. AUTOMATIC TELEPHONE SYSTEM; A. H. Dyson, Montclair, N. J. App. filed Aug. 19, 1907.

1,563,348. ELECTRICALLY HEATED DEVICE; K. Ehrgott, Pittsburgh, Pa. App. filed April 21, 1924. Means for connecting heating elements.

1,563,353. ELECTRIC COOKY BAKER; F. F. Forshee, Flint, Mich. App. filed Aug. 22, 1922.

1,563,354. TRANSFORMER-COOLING SYSTEM; C. Le G. Fortescue, Pittsburgh, Pa. App. filed Aug. 17, 1920.

1,563,357. PRESS BUTTON; A. C. Gaynor, Stratford, Conn. App. filed Dec. 22, 1922.

1,563,363. RESISTOR; I. J. Hibbard, Edgewood, Pa. App. filed July 22, 1921. For railway motors.

1,563,370. TESTING SET FOR TELEPHONE SYSTEMS; E. Jacobsen, New York, N. Y. App. filed April 11, 1923.

1,563,377. PULLING AND TRANSPOSING MECHANISM FOR LINE WIRES; C. H. Klein, Jersey City, N. J. App. filed Oct. 15, 1919.

1,563,380. ELECTRIC MOTOR MECHANISM; G. R. Kunkle, Elyria, Ohio. App. filed May 14, 1923. For operating signal horns and the like.

1,563,386. CATENARY SYSTEM; P. A. McGee, Wilkinsburg, Pa. App. filed Jan. 7, 1922.

1,563,397. PNEUMATIC BRUSH HOLDER; R. E. Rambo, Wilkinsburg, Pa. App. filed April 8, 1924. Brush held in contact with the commutator by pneumatic pressure.

1,563,398. AUTOMATIC RECLOSING CIRCUIT INTERRUPTER; M. E. Reagan, Pittsburgh, Pa. App. filed April 18, 1922. Sectionalizing switches.

1,563,399. ELECTRICAL PROTECTIVE DEVICE; F. E. Ricketts, Catonsville, Md. App. filed Sept. 24, 1920. For protecting parallel-connected transmission circuits.

1,563,407. MECHANICAL RECTIFYING SYSTEM; J. Slepian, Wilkinsburg, Pa. App. filed Sept. 25, 1919.

1,563,425. WIRELESS RECEIVING SYSTEM; R. E. Marbury, Edgewood Park, Pa. App. filed June 17, 1920.

1,563,426. CONDENSER FOR POWER-FACTOR CORRECTION; R. E. Marbury, Wilkinsburg, Pa. App. filed Oct. 7, 1921. For low-voltage application.

1,563,432. COMPOSITE RINGER FOR TRANSMISSION SYSTEMS; H. Nyquist, Elmhurst, N. Y. App. filed Sept. 10, 1921. Telephone system.

1,563,441. ELECTRIC FURNACE CONTROL; E. V. Schall, Harrisburg, Pa. App. filed Sept. 12, 1923.

1,563,453. ELECTRIC HEATER; E. E. Sutherland, Mansfield, Ohio. App. filed Nov. 28, 1923. Resistor-supporting means therefor.

1,563,454. ELECTRIC RESISTOR SUPPORT; E. E. Sutherland, Mansfield, Ohio. App. filed April 21, 1924.

1,563,458. PERCOLATOR HEATER UNIT; V. G. Vaughan, Wilkinsburg, Pa. App. filed Feb. 18, 1924.

1,563,474. CASCADE MACHINE; F. Creedy, Ilkley, England. App. filed July 30, 1921.

1,563,488. CIRCUIT INTERRUPTER; J. F. Hoge, New York, N. Y. App. filed Nov. 17, 1921. Means and methods for obtaining relatively high-frequency interruptions.

1,563,517. SIGNALING SYSTEM; P. B. Murphy, Nyack, N. Y. App. filed Aug. 6, 1924. Over telephone transmission lines.

1,563,537. TIME SWITCH; J. G. Steiss, Kitchener, Ontario, Canada. App. filed Jan. 8, 1923.

1,563,544. BRAKE MECHANISM AND MAGNET SYSTEM THEREFOR; W. S. Atkinson, Ashland, N. J. App. filed Dec. 14, 1923.

1,563,546. ELECTRIC MOTOR-DRIVEN CHANGE-SPEED DEVICE; C. Bouillon, Torrington, Conn. App. filed March 1, 1922.

1,563,555. ELECTRICAL SWITCHING MECHANISM; E. H. Clark, Richmond Hill, N. Y. App. filed Aug. 3, 1923. For telephone-exchange system.

1,563,556. TELEPHONE SYSTEM; E. H. Clark, Richmond Hill, N. Y. App. filed Sept. 18, 1923. Machine switching.

1,563,557. OPTICAL MEANS FOR RECTIFYING ALTERNATING CURRENTS; W. W. Coblentz, Washington, D. C. App. filed Sept. 18, 1923.

1,563,562. ELECTRIC HEATER; J. Gasser, Trenton, N. J. App. filed March 30, 1923. For domestic use.

1,563,578. ADJUSTABLE CONTACT MEANS; B. F. Lollis, Berwyn, Ill. App. filed Feb. 14, 1924. Relay devices as are used in railway-signaling system.

1,563,599. TELEPHONE-EXCHANGE SYSTEM; J. N. Walters, East Orange, N. J. App. filed Sept. 19, 1923. Machine switching.

1,563,612. ELECTRIC WELDING APPARATUS; A. E. Cutler and P. A. Marsden, Newcastle, New South Wales, Australia. App. filed July 24, 1923.

1,563,618. TELEPHONE-EXCHANGE SYSTEM; E. S. Gibson, Ridgewood, N. J. App. filed May 22, 1923. Automatic switching.

1,563,620. OSCILLATION GENERATOR; W. S. Gorton, East Orange, N. J. App. filed May 4, 1921.

1,563,630, 1,563,631. TELEPHONE SYSTEM; E. E. Hinrichsen, New York, N. Y. App. filed Dec. 29, 1920. Machine switching.

1,563,643. TELEPHONE SYSTEM; J. B. Newsom, Brooklyn, N. Y. App. filed Dec. 15, 1923. Impulse-sending circuits.

1,563,644. WAVE-RECEIVING SYSTEM; H. W. Nichols, Maplewood, N. J. App. filed Dec. 13, 1924. Carrier-wave receiving system.

1,563,652. AUTOMATIC TELEPHONE SYSTEM; W. T. Powell, Rochester, N. Y. App. filed Jan. 18, 1922.

1,563,658. LINE SWITCH; C. D. Richard, West New Brighton, N. Y. App. filed June 1, 1922. Co-ordinate switch.

1,563,670. ELECTROMAGNETICALLY OPERATED STARTER SWITCH; L. C. Spencer, Ogden, Utah. App. filed June 10, 1924.

1,563,697. SWITCH COVER; A. Finkernagel, Baltimore, Md. App. filed Oct. 7, 1921. For switchboard use.

1,563,721. ELECTRIC SIGNAL SWITCH; J. O. Cadieux, Meriden, Conn. App. filed Jan. 10, 1925.

Financial and Corporate

Utility Market Irregular

Gains Outnumber Losses, However—American Water Works Jumps to Another New High

A SOMEWHAT more optimistic spirit prevailed in the general market for securities in the week under review, although the attention of market followers to holiday activities has diminished the volume of trading. Money conditions remain satisfactory, and fears of an immediate change in the rediscount rate of the Federal Reserve Bank of New York seem to have passed.

On the New York Stock Exchange the power and light issue of chief interest again was American Water Works & Electric Company's stock, which crossed 76, a price that compares with a 1925 low for the present stock of 34 and a fraction. The stock that now sells for 76 or thereabouts is, incidentally, the same stock that sold around 40 and 50 less than two years ago before a five-to-one split was made. Explanation for the rise is to be found in the rapid growth of earnings, which accrue to a relatively small volume of stock outstanding. While International Paper Company's stock does not, strictly speaking, belong in the power and light category, interest in that company's power properties appears to have been the main market stimulant for that issue in its recent climb to new high ground for the year.

On the New York curb market attention was drawn afresh to the shares of the Southeastern Power & Light Company on the news that the President favors action on Muscle Shoals on a business basis. Commonwealth Power Corporation's shares rose in smart fashion at one time to a level of 40, which, while higher than any prices recently recorded for the issue, does not equal the highest price ever made. Northern Ohio Power shares got under way again after their decline from 19 to a level of about 14, moving in one session to a level above 16. Losses were sustained by Mississippi River Power, Portland Electric and some others.

Copley Utilities Merge

The Western United Corporation, a merger of all operating companies of the Copley interests in Illinois, will be consolidated with the Copley Utilities, Inc., and notices of a meeting December 23 to approve this plan have been sent to stockholders. This will complete consolidation of the various Copley interests under one corporation, and Colonel Copley will remain as president of the company, although a minority holding will be taken by A. E. Fitkin & Company of New York and E. H. Rollins & Company of Boston. Under the consolidation plan all outstanding bonds of all the companies will be called in, including those of the Western United, and full purchase price, with a bonus, will be paid. The bondholders may reinvest in new bonds of the new corporation or take cash. Stockholders, both common and preferred, will be privileged to exchange on a share-for-share basis or accept a cash settlement.

Copley Utilities, Inc., is a new Illinois corporation with the same powers as the Western United Corporation. Twenty classes of securities and stocks in the various units will be reduced to first mortgage bonds, preferred and common stock of the holding and of the operating company under the merger.

Dividends Declared

The quarterly dividends listed below have been announced by electric light and power and electrical manufacturing companies during the past week:

Name of Company	Per Cent	When Payable
Alabama Power, pf	1¾	Jan. 1
American Brown, Boveri Elec., pf	$1.75	Jan. 1
American Power & Light, pf	$1.50	Jan. 2
American Superpower, 1st pf	$1.50	Jan. 2
Asheville Power & Light, pf	1¾	Jan. 2
Birmingham Electric, pf	$1.75	Jan. 2
Canadian General Electric, pf	1¾	Jan. 2
Carolina Power & Light, pf	$1.75	Jan. 2
Century Electric, com	1½	Dec. 22
Century Electric, pf	1¾	Jan. 1
Chickasha Gas & Electric, pf	1¾	Dec. 31
Electric Light & Power of Abington & Rockland	.50	Jan. 2
Electric Light & Power of Abington & Rockland, extra	.50	Jan. 2
Electric Storage Battery, com. & pf.	$1.25	Jan. 2
Elec. Storage Battery, com. & pf. (ex.)	$1	Jan. 2
Electric Vacuum Cleaner, pf	1¾	Jan. 2
El Paso Electric, com	$1.25	Dec. 15
El Paso Electric, pf. A	$2	Jan. 2
El Paso Electric, pf. A	$1.75	Jan. 2
El Paso Electric, pf. B	$1.75	Jan. 2
Jamaica Public Service, pf	$1.75	Jan. 2
Jersey Central Power & Light, pf	1¾	Jan. 1
Kentucky Securities, com	1½	Jan. 2
Kentucky Securities, pf	1¾	Jan. 15
Laurentide Power	1½	Jan. 15
Long Island Lighting, pf	1¾	Jan. 2
Manila Electric, com	.50	Dec. 31
Massachusetts Lighting Cos., com.	.75	Dec. 31
Massachusetts Lighting Cos., 6% pf.	1½	Jan. 15
Massachusetts Lighting Cos., 8% pf.	2	Jan. 15
Midland Utilities, pf., A	1¾	Jan. 6
Midland Utilities, pf. In	1¾	Jan. 6
Mountain States Power, pf	1¾	Jan. 20
Narragansett Electric Lighting	$1	Jan. 2
Newport News & Hampton Railway, Gas & Electric, com	1¼	Jan. 1
Newport News & Hampton Railway, Gas & Electric., pf	1¾	Jan. 1
New York Central Electric, pf	1¾	Jan. 2
Northern New Jersey Utilities, com.	.75	Jan. 15
Northern States Power, pf	1¾	Jan. 20
Northern States Power, com. A	2	Feb. 1
Northern States Power, com. B	.20	Feb. 1
Ohio River Edison, pf	1¾	Jan. 1
Pacific Gas & Electric, com	2	Jan. 15
Panama Power & Light, pf	1¾	Jan. 2
Pennsylvania Power & Light, pf	$1.75	Jan. 2
Pittsburgh Transformer, pf	2	Jan. 2
Pittsburgh Transformer, com	2	Jan. 2
Pittsburgh Transformer, com. (ex.)	....	Dec. 31
Portland Electric Power, 1st pf	1¾	Jan. 2
Power Corp. of New York, com	.25	Jan. 2
Public Service Co. of Okla., com.	2	Dec. 31
Public Service Co. of Okla., pr.ln	1¾	Dec. 31
Public Service Co. of Okla., pf	1¾	Dec. 31
Springfield (Mo.) Ry. & Lt., pf	1¾	Jan. 2
St. Cloud Public Service, 1st pf	1¾	Jan. 2
Standard Gas & Elec., 7% pr.pf	1¾	Jan. 25
Std. Gas & Elec., 6% non-cum. stk.	1¼	Jan. 15
Standard Gas & Electric, com	.75	Jan. 25
Toledo Edison, pr. pf	2	Jan. 2
United Gas & Electric, pf	1¾	Jan. 1
United Gas Improvement	$1	Jan. 15
United Light & Power, A and B com.	.60	Feb. 1
United Light & Power, pf. A	$1.62	Jan. 2
United Light & Power, pf. B	$1	Jan. 2
Virginia Railway & Power, pf	1¾	Jan. 20
Western States Gas & Electric, pf	1¾	Jan. 15
Yadkin River Power, pf	$1.75	Jan. 2

Ten Million Dollars in Italian Securities Offered

On Friday of last week the International Power Securities Corporation, through Aldred & Company, Harris, Forbes & Company, Bankers' Trust Company, Minsch, Monell & Company, Inc., all of New York, and the First National Corporation of Boston floated a loan of $10,000,000 in 6½ per cent secured gold bonds, dated December 1, 1925, and due December 1, 1955, the price being 93¾ and interest, to yield 7 per cent. The International Power Securities Corporation was formed two years ago for the purpose of acquiring selected securities and obligations of leading electric light and power companies at home and abroad.

Proceeds from the sale of the issue are to be used in part to finance extensions for the Edison General Italian Electric Company of Milan, now nearing completion. The Edison company, which is an operating and a holding company, is the oldest central-station company in Italy with a present generating capacity of 174,000 hp. The system serves the most important industrial section of Italy.

New Capital Issues

The Northern States Power Company of Minnesota, which early this month made an eight-and-one-half-million-dollar offering of first lien and general mortgage gold bonds, was represented in the new light and power financing during the past week by another substantial issue. To pay part of the cost of acquiring the common stock of the St. Paul Gas Light Company the Northern States company issued 5½ per cent gold notes, amounting to $7,500,000, the price being 96 and interest, to yield over 5.90 per cent.

Cumulative preferred stock of the Lexington Utilities Company to the amount of $1,500,000 was offered at $93 and accrued dividends per share, to yield about 7 per cent.

A new issue of Ohio Power Company first and refunding mortgage 5 per cent gold bonds was offered during the week, a piece of financing involving a total of $5,662,000. The bonds were priced at 94½ and accrued interest, to yield about 5.39 per cent. The company is one of the most important subsidiaries of the American Gas & Electric Company and has shown rapid growth in the last six years.

Narragansett Stock Issue of Nearly Four Millions.—Directors of the Narragansett Electric Lighting Company, Providence, R. I., have authorized an additional issue of $3,916,800 in capital stock at par, $50 per share, the certificates to be dated January 1, 1926. Acceptance of a charter amendment passed at the last legislative session to permit the company to increase its total capital stock to thirty million dol-

lars was voted by the stockholders. The forthcoming issue will expand the company's outstanding capital stock to $23,500,800. In announcing the new issue President E. A. Barrows stated that the normal growth of the business and additions to plant have lately called for the expenditure of more than $5,000,000, the principal items being a new boiler house with four 1,800-hp. boilers, about $1,500,000; a new General Electric turbine (43,500 kva.), addition to the turbine hall with piping and accessories, $890,000; coal-pulverizing plant, $490,000; new intake for entire station, $580,000, and improvements to transmission and distribution system, $2,000,000. Relative to rumors that outsiders are seeking control of the company, Mr. Barrows said that in his opinion a company locally owned and managed can best serve the community and that he felt that this condition should and would continue.

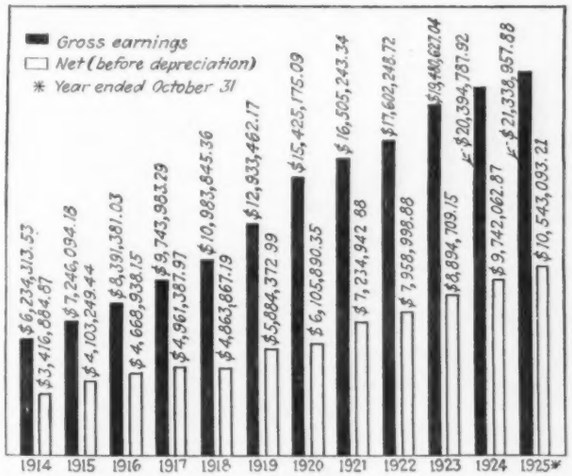
Northern States Power Company's Growth

Consolidated Gross Earnings Since 1914 Have Risen from $6,234,313 to $21,338,957—Soon Will Conduct All Gas and Electric Business in St. Paul

BY PAUL WILLARD GARRETT

FLOTATION last week of an issue of Northern States Power Company's first lien and general mortgage bonds totaling $8,500,000 calls attention afresh to the development of a Byllesby property that has enjoyed a tremendous growth in the last fifteen years. If we measure the growth by the system's consolidated gross earnings, expansion is reflected in the rise of such earnings from $6,234,313 in 1914 to $21,338,957 in the twelve months ended October 31, 1925. Net earnings before depreciation in that time have grown from $3,416,884 to $10,543,093.

These properties, which, as indicated, are under the management of the Byllesby Engineering & Management Corporation, serve a population of nearly 1,400,000 in various sections in Minnesota, Wisconsin, Illinois, North Dakota, South Dakota and Iowa. Among the 505 communities that benefit from the services of these utilities in the electric power and light, gas or steam-heat fields are such centers as Minneapolis, part of St. Paul, Faribault, Mankato, St. Cloud, Red Wing and Winona, Minn.; La Crosse, Eau Claire and Chippewa Falls, Wis., and Grand Forks and Fargo, N.D.



THE NORTHERN STATES POWER COMPANY HAS NEVER RECORDED A DECREASE IN ITS ANNUAL GROSS EARNINGS

An announcement has already been made to the effect that the Northern States Power Company expects soon to acquire control of the St. Paul Gas Light Company, and on completion of that arrangement, it may be noted, Northern States will conduct the entire electric light and power and gas business in the city of St. Paul.

The capital structure of the Northern States Power Company is a conservative one, from the standpoint of earnings applicable to capital obligations. Of mortgage bonds the company has $80,542,600, including the new issue of $8,500,000 as follows: First lien and general mortgage 6's, series A, of 1948, $14,270,000; first lien and general mortgage 5½'s, series B, of 1950 (new issue), $8,500,000; first and refunding mortgage 5's and 6's of 1941 outstanding to the amount of $34,053,000 and underlying divisional liens to the amount of $23,719,600. Notes to the amount of $11,599,000 are outstanding as follows: Gold 6½ per cent notes of 1933 in the amount of $4,850,200 and convertible 6½'s of 1933 to the amount of $6,748,800. Of capital stock there are the class A common shares outstanding to the amount of $16,957,300, the class B common shares outstanding to the amount of $5,000,000, the 7 per cent cumulative preferred shares outstanding to the amount of $48,545,700 and the divisional stocks outstanding to the amount of $818,550.

Annual interest requirements on the $80,542,600 of mortgage bonds and dividends on the $818,550 of divisional stocks aggregate, if such charges are reckoned on the basis of the new capital set-up, $4,484,361. As was said earlier in this analysis, net earnings available for interest, depreciation and dividends for the twelve months ended October 31, 1925, were $10,543,093, an amount, it may be seen, sufficient to cover fixed charges presently to be outstanding two and a third times. In figuring this way, of course, account is not taken of the larger earnings likely to accrue as a result of the financing itself.

That the new financing has been done under the company's new open-end lien illustrates the advantages of such a mortgage as was drawn up some time ago by the company's bankers. The present financing has been done with a 5½ per cent coupon rate, although the series A bonds of the same mortgage carried a 6 per cent coupon. Such mortgages are flexible, enabling the company to take advantage of a favorable money market. Additional bonds may be issued under the same mortgage, but conservative restrictions are set up to protect bondholders against excessive issuance of such bonds.

Company Reports

The following statements of earnings have been issued by electric light and power companies for the month of October:

Name of Company	Gross Earnings for October 1925	1924
American Water Wks. & Elec.	$3,485,879	$3,172,774
Asheville Power & Light	100,557	91,046
Barcelona Trac., Lt. & Power	7,270,724	6,517,789
Blackstone Valley Gas & Elec.	458,725	419,190
Brazilian Trac., Lt. & Power	3,100,963	2,485,495
Cape Breton Electric	50,407	53,341
Carolina Power & Light	383,077	268,232
Cent. Mill Valley Elec. Prop.	53,858	50,993
Columbus Electric & Power	257,679	209,784
Community Power & Light	308,585	239,483
Edison Elec. Illg. of Brockton	140,980	143,090
Electric Light & Power Co. of Abington & Rockland	49,798	39,039
El Paso Electric	217,684	203,896
Galveston-Houston Electric	338,471	344,405
Havana Elec. Ry., Lt. & Pwr.	1,277,949	1,197,400
Houghton County Electric Lt.	43,762	40,248
Idaho Power	21,328	211,906
Keokuk Electric	37,163	35,755
Key West Electric	24,736	22,252
Lowell Electric Light	149,738	139,665
Manila Electric	335,239	318,195
Mississippi River Power	300,422	270,116
Nevada-California Electric	298,277	309,433
New Bedford Gas & Edison Lt.	343,110	214,595
No. Ontario Light & Power	128,530	110,408
Northern Texas Electric	215,495	235,554
Paducah Electric	55,040	50,767
Puget Sound Power & Light	1,099,779	1,028,259
Savannah Electric & Power	175,206	157,882
Sierra Pacific Electric	91,777	90,806
Southern Canada Power	111,041	90,203
Southwestern Power & Light	1,235,500	1,144,563
Tampa Electric	309,481	198,660
Utah Power & Light	838,325	788,341
West Penn	2,188,091	2,085,759
Winnipeg Electric	476,913	430,185
Yadkin River Power	178,446	168,060

Havana Plan Operative. — The plan for the exchange of Havana Electric Railway, Light & Power Company securities for Havana Electric & Utilities Company securities has been declared operative. More than 175,000 shares of the former company's 210,000 shares of 6 per cent preferred stock and about 141,000 shares of the company's 150,000 shares of common stock have been deposited under the plan.

New Corporation to Be Organized to Acquire Holdings Abroad. — The Associated International Electric Corporation has been organized in Connecticut to acquire, develop and hold investments of the Associated Gas & Electric Company outside the United States. The new corporation will give its stock in exchange for the present stock of the Manila Electric Corporation, which was acquired by the Associated system last summer. A recent letter to Manila Electric stockholders stated that in view of emergencies which will require considerable cash the directors believed it inadvisable to con-

tinue paying the present dividend rate of $2.50 per share annually on the common stock and that the rate of $2 per annum should be restored. Former officers of the Manila Electric have been elected to the board of the new company.

Stock Issue Approved.—The Massachusetts Department of Public Utilities has authorized the Beverly Gas & Electric Company to issue 11,000 additional shares of capital stock (par $25) at $60 per share. The increase will make the capitalization of the company $1,100,000, consisting of 44,000 shares, par $25.

Southern Canada Power Issues Twelfth Annual Report. — New high records in gross and net earnings, as well as in the number of customers served, are indicated in the twelfth annual report of the Southern Canada Power Company, Ltd., covering the year ended September 30, 1925. Gross earnings amounted to $1,213,665, as against $1,150,863 in the preceding fiscal year, which was the former record. Net earnings amounted to $713,566, as compared with $671,479, and after deducting interest charges and bad debts the year's surplus before depreciation was $438,241, as compared with $394,774 in the preceding period.

Earnings of California's Municipal Electric Plants.—A net income of $4,506,909 was earned during the past year by the twenty-two municipally owned electric systems in California, according to State Controller Ray L. Riley's annual report on city financial transactions. The gross income of the municipal electric systems was $12,574,648, while the expenses amounted to $8,067,739.

American Power & Light Issues Report.—Aggregate gross and net earnings for October and for the twelve months ended October 31, 1925, of subsidiaries of the American Power & Light Company were the largest for any month and any twelve-month period in the company's history. Gross earnings for the month of October were $4,495,173, an increase of 20 per cent over those for October, 1924. Net earnings for the month were $2,057,517, an increase of 27 per cent. For the twelve months ended October 31, 1925, gross earnings of the subsidiaries were $48,956,195, as compared with $43,061,044 for the twelve months ended October 31, 1924. This is an increase of 14 per cent. Net earnings for the twelve months ended October 31, 1925, were $22,135,593, as compared with $18,382,668 for the twelve months ended October 31, 1924. This figure represents an increase of 20 per cent over that recorded for the same period last year.

Bonds Called in December.—Among the bonds of electric light and power companies called for payment in December in advance of maturity are the following:

Issues	Due	Amount
Southern Canada Power 6's	1948	$4,173,000
Central States Electric 7's	1929	4,000,000
Central States Electric 5's	1926	2,961,000
Missouri Power & Light 7's	1943	2,978,000
Intermountain Railway, Light & Power 7's	1945	2,175,000
Middle West Utilities, B 8's	1940	2,142,700
Missouri Power & Light, B 6½'s	1943	1,200,000
North Missouri Power 6½'s	1942	850,000
Tri-State Utilities Inc. 7's	1934	100,000
Federal Power & Light 7's	1929	150,000
Catawba Power 6's*	1933	12,000

* Not entire issue.

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Saturday, Dec. 12	Low 1925	High 1925
STOCKS			
Abitibi Pwr. & Paper, com.—no par	*j* 74½	62	76½
Adirondack Pwr. & Lt.—7% pf.	102	98	106
Adirondack Pwr. & Lt.—8% pf.	102	103	115
Adirondack Pwr. & Lt., com.—50	*i* 75	31	98
Ala. Pwr., pf.	104½	97½	106
Allis-Chalmers Mfg. pf.	*j* 109	103½	109
Allis-Chalmers Mfg., com.	*j* 96½	71½	97½
Amer. & Foreign Pwr., pf. 25% pd.	*j* 135	114	142
Amer. & Foreign Pwr., 7% pf.	*j* 93½	87	94
Amer. & Foreign Pwr., com.	*j* 45	27½	51⅝
Amer Bosch Magneto, com.—no par	*j* 33	26½	54½
Amer. Brown, Boveri, ptc., stk.	*j* 50½	49½	53½
Amer Elec. Pwr., pf.	*c* 102	91	104½
Amer. Gas & Elec., 6% pf.—no par	95	85	93
Amer. Gas & Elec., com.—no par	79	70	85
Amer. Lt & Trac., 6% pf.	114	93	115
Amer. Lt. & Trac., com.	262	139	288
Amer. Pwr. & Lt., 6% pf.	95	84	95
Amer. Pwr. & Lt., com.—no par	61	52	67½
Amer. Pub. Serv., 7% pf.	96	88	96
Amer. Pub. Serv., com.	47	45	90
Amer. Pub. Utilities, 4% pf.	79	....	....
Amer. Pub. Utilities, 6% pf.	80	71	82
Amer. Pub. Utilities, 7% pf.	88	87	95
Amer. Pub. Utilities, com.	78	70	103
Amer. Superpwr., pf.—25	*j* 25	....	....
Amer. Superpwr., Class A—no par	*j* 32½	....	....
Amer. Superpwr., Class B—no par	*j* 34	....	....
Amer. Wtr. Wks. & Elec., 7% pf.	100½	98	103
Amer. Wtr. Wks. & Elec., com.	*j* 74	34½	76½
Appalachian Pwr., 7% pf.	101	92	100
Appalachian Pwr., 1st pf., 7%	101	95	101
Appalachian Pwr., com.—no par	78	70	83
Arizona Pwr., 7% pf.	83	75	87
Arizona Pwr., com.	30	15	34½
Arkansas Cent. Pwr., pf., $7—no par	100	97	102
Arkansas Lt. & Pwr., 7% pf.	98	92	102
Arkansas Lt. & Pwr., com.	100	65	101
Asheville Pwr. & Lt., 7% pf.	*k*101½	98	104
Assoc. Gas & Elec., 7% Y.—1% extra—50	*j* 50	....	....
Assoc. Gas & Elec., pf.—$6—no par	*j* 80	....	....
Assoc. Gas & Elec., Class A	*i* 34½	....	....
Babcock & Wilcox, com.	*j* 142	....	....
Birmingham Elec. pf.—$7—no par.	102	98	103
Blackstone Valley Gas & Elec., com.—50	96	....	....
Blaw-Knox, com.	*i* 59	59	60
Brazilian Trac., Lt. & Pwr., com.	*j* 81½	....	....
Broad River Pwr., pf.	93	90	97
Brooklyn Edison, com.	*j* 134½	120½	156½
Buffalo Gen. Elec., com.—no par	*i* 58	50	77
Buffalo, Niagara & East. Pwr., pf.—25	*j* 23½	....	....
Buffalo, Niagara & Eastern Pwr., com	*j* 31½	....	....
Carolina Pwr. & Lt., pf.—$7—no par	105	100	107
Carolina Pwr. & Lt., com.	430	290	456½
Central & S. W. Utilities, 7% pf.—no par	*a* 88½	88	90½
Central & S. W. Utilities, pr. In. pf.—no par	*a* 98½	96½	100
Central Ariz. Lt. & Pwr., pf.	101	100	106
Central Ark. Ry. & Lt., 7% pf.	96	91	98½
Central Ill. Pub. Serv., 6% pf.	86	84	93
Central Ind. Pwr., 7% pf.	85	88	95
Central Pwr. & Lt., pf.	94½	88	96½
Central States Elec., 7% pf.	94	87	98
Central States Elec., com.	220	70	250
Century Elec. com.	*l* 103	103	110
Chicago Fuse Mfg., com., no par	*a* 33	27½	29½
Cincinnati Gas & Elec., com.	*g* 90½	82	90
Cities Service, 6% pf.	84	80	84
Cities Service, pf. B—10	*j* 7½	....	....
Cities Service, pf. BB—100	*j* 76	....	....
Cities Service, com.—20	38½	34	43
Cities Service, Bkrs. Shrs.—10	17½	16½	22
Cleveland Elec. Illg., 6% pf.	102	101	105
Cleveland Elec. Illg., com.	240	200	250
Colorado Pwr., 7% pf.	96	93	98
Columbia Gas & Elec., 7% pf.	112½	104½	113½
Columbia Gas & Elec., com.—no par	*j* 83½	45½	86
Columbia Ry., Gas & Elec., 6% pf.	90	90	90
Columbus Elec. & Pwr., 2d pf.	*j* 100	....	....
Columbus Elec. & Pwr., com.	*j* 150	....	....
Columbus Ry., Pwr. & Lt., pf. A	98	86	99
Columbus Ry., Pwr. & Lt., pf. B	92	80	85
Columbus Ry., Pwr., & Lt., com—no par	82	70	85
Commonwealth Edison, com.	*a* 139½	130½	141½
Commonwealth Pwr., 6% pf.	87	80	88
Commonwealth Pwr., com—no par	36	30½	43½
Conn. Lt. & Pwr., 8% pf.	118	115	118
Conn. Lt. & Pwr., 7% pf.	111	105	110
Cons. Gas of N. Y., pf.—50	*j* 57	....	....
Cons. Gas of N. Y., com—no par	*j* 95½	74½	97
Cons. Gas Elec. Lt. & Pwr. of Balti., 6% pf.	*c* 104	102	105
Cons. Gas, Elec. Lt. & Pwr. of Balti., 6½% pf.	*c* 109½	105	110½
Cons. Gas, Elec. Lt. & Pwr. of Balti. 7% pf.	*c* 112	109	114
Cons. Gas, Elec. Lt. & Pwr. of Balti. 8% pf.	*c* 126	122	127½
Cons. Gas, Elec. Lt. & Pwr. of Balti. com.—no par	*c* 44½	32	47½
Cons. Utilities of Dela., 7% pf.	*i* 85	80	84
Consumers Pwr., 6% pf.	96	90	97
Consumers Pwr., 6 6% pf.	101	97	102
Continental Gas & Elec., 7% ptc. pf	95½	85	97
Continental Gas & Elec., 7% pr. pf.	96	89	97
Continental Gas & Elec., com—no par	145	77	152
Crocker Wheeler, com.	13	14	28
Crocker Wheeler, pf.	48	47	80
Dallas Pwr. & Lt., 7% pf.	102	100	102½
Dayton Pwr. & Lt., 6% pf.	95	88	100
Dayton Pwr. & Lt., com.	420	180	460
Detroit Edison, com.	*j* 138	110	159½
Dubilier Condenser & Radio, com.	*j* 9½	....	....
Dubuque Elec., 7% pf.	91	80	90
Duquesne Lt., 7% pf.	109	104	112
East. Tex. Elec., 7% pf.	100	100	105
East. Tex. Elec., com.—no par	80	70	75½
Edison Elec. Illum. of Boston, com.	*d* 209½	200	213
El Paso Elec., com.	*j* 78	....	....
El Paso Elec., pf.	*j* 100	....	....
Elec. Bond & Share, 6% pf.	*k*103½	101½	106½
Elec. Bond & Share Sec., com.—no par	*k* 66½	56½	80½
Elec. Investors, 6% pf.—no par	92	95	96
Elec. Investors, com.—no par	70½	30	79½
Elec. Investors, 10% pd. receipts	52	15	62
Elec. Pwr. & Lt., ctfs. pf.	*j* 93½	89½	94½
Elec. Pwr. & Lt., ctfs., 40% pd.	*j* 107½	100	110
Elec. Pwr. & Lt., ctfs. full pd.	110	100½	110½
Elec. Pwr. & Lt., ctfs. com.	*j* 31½	17½	40½
Elec Ry. Securities, com.—no par	*i* 24	....	....
Elec. Storage Battery, com.—no par	*j* 78	60½	80
Elmira Wtr., Lt. & R.R., 7% pf.	96½	93	98
Emerson Ele., pf.	*b*100½	95	101½
Empire Dist. Elec., 6% pf.	80	78	85
Engr. Pub. Serv., pf.—no par	99	100	103
Engr. Pub. Serv., com.—no par	24	19½	30
Eureka Vacuum Cleaner, com.—no par	*j* 56	48½	56
Fairbanks Morse, com.	*j* 50½	32½	54½
Fairbanks Morse, pf.	*i* 110½	106½	110½
Federal Lt. & Trac., com.	*j* 36½	26	37½
Federal Light & Traction, pf.	*i* 85½	82½	86½
Federal Utilities, pf.	*j* 75	....	....
Federal Utilities, com.	*j* 17	....	....
Ft. Worth Pwr. & Lt., 7% pf.	*k*105	99½	107½
Galveston-Houston Elec., 6% pf.	64	70	75
Galveston-Houston Elec., com.—no par	25	20	40
Gen. Elec., com.	*j* 327	227½	337½
Gen. Elec., special—10	*j* 11½	10½	11½
Gen. Gas & Elec., 6% pf.—no par.	100	72	240
Gen. Gas & Elec., 7% pf.	100	120	175
Gen. Gas & Elec., com.—no par	100	72	240
Gen. Gas & Elec., (Me.) pf.—$7—no par	100	90	175
Gen. Gas & Elec., (Me.) pf.—$8—no par.	100	104½	180
Gen. Gas & Elec. (Del.) com. A no par	58½	42	64½
Gen. Gas & Elec. (Del.) com. B no par	50	40	62
Gen. Gas & Elec. (Del.) A pf. 7% no par	95	97½	100
Gen. Gas & Elec. (Del.) A pf. 8% no par	107	90	111
Gen. Gas & Elec. (Del.) B pf. 7% no par	94	88	97½
Ga. Lt., Pwr., & Rys., 6% pf.	75	74	85
Ga. Lt., Pwr. & Rys., com.	60	25	74
Ga. Ry. & Elec., 5% pf.	*i* 76	78½	84½
Ga. Ry. & Elec., com.	*j* 124½	115½	115½
Ga. Ry. & Pwr., 8% pf.	*j* 112½	....	....
Ga. Ry. & Pwr., 7% pf.	*j* 100½	....	....
Ga. Ry. & Pwr., 4% pf.	128	62	140
Ga. Ry. & Pwr., com.	133	62	145
Gt. Western Pwr., 7% pf.	*h*101	....	....
Havana Elec. Util., com.	42	42	45
Havana Elec. Util., pf.	69½	66	70½
Hurley Machine, com.—no par	*a* 51	41½	56
Idaho Pwr., 7% pf.	100½	97½	102
Ill. No. Utilities, pf.	88	82½	92
Ill. Pwr. & Lt., 6% pf.	96½	92½	98
Int. Combustion Engr., com.—no par	*j* 65½	31½	69½
Int. Utilities, class A—no par	*j* 39	....	....
Int. Utilities, class B—no par	*j* 7½	....	....
Interstate Pwr., pf., $7, no par	90	90	98
Interstate Pub. Serv., 7% pf.	96	90	100
Iowa Ry. & Lt., 7% pf.	97	92	100
Jersey Central Pwr. & Lt., 7% pf.	94	90	96
Jersey Central Pwr. & Lt., com.—no par	45	15	50
Johns-Manville, com.—no par	*j* 161	....	....
Kansas Gas & Elec., 7% pf.	*k*102	97½	103
Kelvinator Corp., com.—no par	*j* 78½	....	....
Kentucky Hydro-Elec., com.	*a* 93¾	85½	94
Kentucky Sec., 6% pf.	76	67	78
Kentucky Sec., com.	90	77	100
Kentucky Utilities, 6% pf.	89	82	95
Kings County Ltg., 7% pf.	*j* 100	....	....
Laclede Gas Lt., com.	*j* 160	110½	178
Lehigh Pwr. Sec., cap.—no par	192	82	196
Long Island Ltg., 7% pf.	105	100	105
Long Island Ltg., com.—no par	135	60	142
Los Angeles Gas & Elec., 6% pf.	95	90	98
Manila Elec., com.—no par	*j* 32½	28½	49½
Maytag Mfg., com.	*j* 22½	21½	26½
Memphis Pwr. & Lt., pf., $7, no par	102	98½	102
Metropolitan Edison, pf.—$6—no par	92½	92	96
Metropolitan Edison, pf., $7, no par	104	100	110
Middle West Utilities, 7% pf.	*a* 98	91½	98
Middle West Utilities, 7% pr. lien pf.	*a* 107	98	108
Middle West Utilities, com.—no par	*a* 115	92½	125

Stock Exchange: *a*Chicago; *b*St. Louis; *c*Philadelphia; *d*Boston; *e*Baltimore; *f*Montreal; *g*Cincinnati; *h*San Francisco; *i*Pittsburgh. *j*Bid, low, high, Tuesday, Dec. 15 *k*Bid, low, high, Wednesday, Dec. 16. *l*Latest quotations available.

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Saturday, Dec. 12	Low 1925	High 1925
STOCKS—Continued			
Midland Utilities, pr. ln. pf.	a100	98½	101
Midland Utilities, pf. A	a 97	92	97
Milwaukee Elec. Ry. & Lt., 8% pf.	100	98	105
Milwaukee Elec. Ry. & Lt., 7% pf.	98	96	105
Milwaukee Elec. Ry. & Lt., 6% pf.	87	83½	87
Minn. Pwr. & Lt., 7% pf.	k101½	97½	102
Miss. Pwr. & Lt., pf.	j100	....	....
Miss. River Pwr., 6% pf.	95	87½	94
Miss. River Pwr., com.	50	37	124½
Montana Pwr., pf.	j115½	109	117
Montana Pwr., com.	j82	64	99½
Montreal Pwr., com.	f215½	....	....
Mountain States Pwr., pf.	j 94	....	....
Mountain States Pwr., com.	j 26	....	....
National Carbon, com.	l124	120	130
National Carbon, pf.	a127	120	130
National Elec. Pwr., pf.	a 94½	94	96½
National Lt., Ht. & Pwr., 8% pf.	71	40	72
National Lt., Ht. & Pwr., com.—no par	24	11	30
National Pwr. & Lt., pf., $7—no par	102	95	99
National Pwr. & Lt., com.—no par.	445	185	467
National Pub. Serv., 7% pf.	j 94	....	....
National Pub. Serv., pfc. pf.	j 94	....	....
National Pub. Serv., A com.—no par	j 23½	....	....
National Pub. Serv., B com.—no par	j 14½	....	....
Nebraska Pwr., 7% pf.	k102	98½	103½
Nevada-Calif. Elec., com.	37	31	58
N. J. Pwr. & Lt., 7% pf.	104	92	102
New Orleans Pub. Serv., 7% pf.	101	94	102
New Orleans Pub. Serv., com.—no par	l 30	31	38½
N. Y. Central Elec., 7% pf.	97	96	101
Niagara Falls Pwr., 7% pf.—25	j 28½	27½	29
Niagara, Lock. & Ont. Pwr., 7% pf.	f106	101½	110
Niagara, Lock. & Ont. Pwr., com.—no par	l 60½	60	73
Nizer Corp., A.—no par	l 80½	37	84
Nizer Corp., B.—no par	j 79½	....	....
No. Amer., 6% pf.—50	49½	46½	50½
No. Amer., com.—10	67½	41½	75
No. Caro. Pub. Serv., pf.—$7—no par	93	90	96
No. N. Y. Utilities, 7% pf.	j102½	....	....
No. Ohio Pwr., com.—no par	14	5	19
No. Ohio Trac. & Lt., 6% pf.	73	64	75
No. Ont. Lt. & Pwr., pf.	74	68	78
No. Ont. Lt. & Pwr., com.	48	41	52
No. States Pwr., 7% pf.	100	95	100
No. States Pwr. com.	137	103	144½
No. Texas Elec., 6% pf.	50	60	75
No. Texas Elec., com.	40	40	70
Ohio Gas & Elec., 7% pf.	90	87	100
Ohio Pwr., 6% pf.	93	85	95
Ohio Pub. Serv., 7% pf.	98	97	100
Ohio River Edison, 7% pf.	97	93½	100½
Oklahoma Gas & Elec., pf.	j 93	....	....
Pacific Gas & Elec., 6% pf.	96	92	99
Pacific Gas & Elec., com.	j132	102½	137½
Pacific Pwr. & Lt., 7% pf.	k99	97½	102
Parr Shoals Pwr., 6% pf.	92	90	100
Penn Central Lt. & Pwr., pf.—no par	c 72½	60	72½
Penn-Ohio Elec., 7% pf.	93	83½	96
Penn-Ohio Pwr. & Lt., 7% pf.	97	91	100
Penn-Ohio Pwr. & Lt., 8% pf.	103	101	110
Penn Pwr. & Lt.—$7—no par	k105½	98½	106½
Penn Pub. Serv., 7% pf.	96	90	100
Penn Pub. Serv., 6% pf.	85	80	90
Penn Wtr. & Pwr., cap.	e161	126½	185
Phila. Co., (Pitts.) pf.—50	c 48	37½	49½
Phila. Co., (Pitts.) com.—50	l 60½	52½	60½
Phila. Elec., com.	c46½	37½	49½
Pittsburgh Utilities, pf.	j16	12½	17½
Portland Elec. Pwr., 7% pf.	98	95	99
Portland Elec. Pwr., 6% pf.	72	70	80
Portland Elec. Pwr., com.	40	40	53
Portland Ry., Lt. & Pwr., pf.	l 72	....	....
Portland Ry., Lt. & Pwr., com.	41	....	....
Pwr. Corp. of N. Y., 7% pf.	f110	96	112
Pwr. Corp. of N. Y., com—no par	75	15	89½
Pwr. Sec., pf —no par	10	10	55
Pwr. Sec., com.—no par	14	8	30
Pub. Serv. of N. J., 7% pf.	j105	99	106
Pub. Serv. of N. J., 8% pf.	118	108½	119
Pub. Serv. of N. J., com—no par.	j 81	62½	87½
Pub. Serv. of No. Ill., 6% pf.	a100½	92	100½
Public Serv. of No. Ill., 7% pf.	a110½	102	111
Pub. Serv. of No. Ill., com.—no par	a132	107½	132½
Pub. Serv. of No. Ill., com.	a130½	118	130½
Pub. Serv. of Okla., 7% pf.	93	87	95
Pub. Serv. Elec. & Gas, 6% pf.	j 99	92½	99½
Puget Sound Pwr. & Lt., 7% pf.	106	102½	107
Puget Sound Pwr. & Lt., 6% pf.	j 84	....	....
Puget Sound Pwr. & Lt., com.	48	49	61
Radio Corp., of Amer., pf.—50	j 42½	45½	54
Radio Corp. of Amer., com.—no par	j 44½	39½	77½
Republic Ry & Lt., pf.	91	70	93
Republic Ry. & Lt., com.	66	49	67
Rochester Gas & Elec., 5% pf.	95	80	98
Servel Corp., Class A	j 30½	....	....
Servel Corp., Class B—no par	58	35	62½
Sierra Pacific Elec., com.	j 25	....	....
Sioux City Gas & Elec., 7% pf.	j 99	....	....
Southeastern Pwr. & Lt., 7% pf.—no par	97	90	100
Southeastern Pwr. & Lt., com—no par	30½	28	34½
So. Calif. Edison, 8% pf.	135	115	128
So. Calif. Edison, 7% pf.	110½	105	107½
So. Calif. Edison, 6% pf.	99	90	95½
So. Calif. Edison, com.	130	102	149
Southern Cities Utilities, 7% pf.	83	77	100
Southern Cities Utilities, com.	40	30	71
Southern Pwr. & Lt. of Md., pf.	j107	....	....
Southern Pwr. & Lt. of Md., com.	ø 32	....	....
Southwestern Pwr. & Lt., A.	j 60	....	....
Southwestern Pwr. & Lt., B.	j31	....	....
Southwestern Pwr. & Lt., 7% pf.	100	90	102
Springfield (Mo.) Ry. & Lt., 7% pf.	96	92	93
Standard Gas & Elec., 8% pf.	l 55	50½	56½
Standard Gas & Elec., 7% pf.	100½	96	100
Standard Gas & Elec., com.—no par	j57½	40½	61
Standard Pwr. & Lt., 7% pf.	108	95	114½
Superheater, com.—No par	142	120	152
Tampa Elec., com.	j282	....	....
Tenn. Elec. Pwr., 6% pf.	85	80	87
Tenn. Elec. Pwr., 7% pf.	99½	93	103
Tenn. Elec. Pwr., pf.—$6—no par.	j 80	72	84
Tenn. Elec. Pwr., com.—no par.	j 65	....	....
Tex. Pwr. & Lt., 7% pf.	k102	99½	106
Tide Water Pwr., 8% pf.	j98	....	....
Timken Roller Bearing, com.	j55½	37½	59½
Toledo Edison, 8% pf.	113	109	114
Toledo Edison, 7% pf.	101	94	101½
Toledo Edison, com.	25	21	25
Tri-City Ry. & Lt., 6% pf.	87	82	85
United Gas & Elec., 6% pf.	93	89	94
United Gas & Elec., com.—no par.	55	46	57½
United Gas & Elec. (N. J.), 5% pf.	65	55	65
United Gas Impr.—50	c116½	79½	120½
United Lt. & Pwr., pf.—$4—no par	50	41	51
United Lt. & Pwr., pf.—$6.50—no par	92	83	99
United Lt. & Pwr., com., A—no par.	150	42	166½
United Lt. & Pwr., com., B—no par.	160	49	169
Utah Pwr. & Lt., 7% pf.	k 99½	97½	101½
Utica Gas & Elec., 7% pf.	103	100	104
Utica Gas & Elec., com.	200	100	200
Utilities Pwr. & Lt., 7% pf.	92	90	97
Utilities Pwr. & Lt., com. B—no par	18½	12	22
Vermont Hydro-Elec., 7% pf.	92	87	96
Virginia Pwr., 7% pf.	99	94	107
Virginia Pwr., com.	65	65	92
Virginia Ry. & Pwr., com.	f149	64½	150
Wagner Elec., pf.	b 83	79	92
Wagner Elec., com.—no par	b 33½	26½	50
Washington Wtr. Pwr., com.	132	110	140
West Mo. Pwr., 7% pf.	j 91	....	....
West Penn., 7% pf. tem. ctf	97½	94	100
West Penn. com.	f123	97	145
West Penn Pwr., pf.	j108½	104	111
West Virginia Lt., Ht. & Pwr., 7% pf.	94	94½	96½
West Va. Utilities, 7% pf.—50	42	38	47
Western Pwr., 7% pf.	96	84	....
Western Pwr., com.—no par	80	34	102
Western States Gas & Elec., 7% pf.	88	82	92
Western States Gas & Elec., com.	j 19	....	....
Westinghouse Elec. & Mfg. com.—50	j 75½	66½	84
Weston Elec. Instrument, Cl. A	j 28½	19½	28½
Weston Elec. Instrument, com.	j18½	9½	20½
Wis.-Minn. Lt. & Pwr., 7% pf.	l 90	92	95
Wis. Pwr., Lt. & Ht., 7% pf.	85	85	90
Worthington Pump, pf. A	79½	76	88
Worthington Pump, pf. B	65½	58	76½
Worthington Pump, com.	j 46½	35½	79½
Yadkin River Pwr., 7% pf.	k103½	98	106
Yale & Towne, com.—25	j 68	62	70½
BONDS			
Abitibi Pwr. & Paper	6s 1940	100	98	101½
Adir. Elec. Pwr.	5s 1962	100	97½	101
Adir. Pwr. & Lt.	6s 1950	104½	102½	105½
Adir. Pwr. & Lt.	5s 1930	97	94	98
Ala. Pwr.	5s 1946	98½	96	100
Ala. Pwr.	5s 1951	95½	92½	97½
Ala. Pwr.	6s 1951	104½	101½	105
Ala. Trac. Lt. & Pwr.	5s 1962	107	86	109
Aluminum Co. of Amer.	7s 1933	106½	106½	107½
Amer. Bosch Magneto	8s 1936	k103	86	101
Amer. Gas & Elec.	5s 2007	91	90	93½
Amer. Gas & Elec.	6s 2014	98½	96½	99
Amer. Pwr. & Lt.	6s 2016	94½	94	98
Amer. Pub. Serv.	6s 1942	98½	94	99½
Amer. Wtr. Wks. & Elec.	5s 1934	96½	92½	98
Amer. Wtr. Wks. & Elec.	6s 1975	94½	94½	95
Anaconda Copper	6s 1929	102½	102½	104
Anaconda Copper	6s 1953	101½	99½	102
Anaconda Copper	7s 1938	104½	99½	105½
Appalachian Pwr.	5s 1941	98½	96	99½
Appalachian Pwr.	6s 2024	93	86½	94
Appalachian Pwr.	7s 1936	106	105½	106½
Arizona Pwr.	6s 1933	100	97½	101
Arizona Pwr.	6s 1947	95½	90	96
Ark. Central Pwr.	6s 1948	100½	98½	102½
Ark. Lt. & Pwr.	6s 1945	103	100	104½
Ark. Lt. & Pwr.	6s 1954	98½	92½	99½
Assoc. Gas & Elec.	6s 1965	94½	92	96
Assoc. Gas & Elec.	6½s 1954	100½	94½	106
Binghamton Lt., Ht. & Pwr.	5s 1946	98½	94½	99
Birmingham Elec.	6s 1954	101½	99	103
Birmingham Ry., Lt. & Pwr.	4½s 1954	87	85	89½
Broad River Pwr.	6½s 1934	100	99	102
Brooklyn Edison	5s 1949	101½	99½	103
Brooklyn Edison	6s 1930	105	103½	106
Buffalo Gen. Elec. 1st	5s 1939	101½	100½	102
Buffalo Gen. Elec. 1st & Ref.	5s 1939	101	100	100½
Burlington Ry. & Lt.	5s 1932	94½	90	96
Butte Elec. & Pwr.	5s 1951	100	99	100½
Calif. Gas & Elec.	5s 1937	100½	98	101½
Canadian Lt. & Pwr.	5s 1949	42	36	62
Canton Elec.	5s 1937	99½	99	100½
Carolina Pwr. & Lt.	5s 1938	100	98½	100½
Carolina Pwr. & Lt.	6s 1953	104½	103½	105
Cedar Rapids Mfg. & Pwr.	5s 1953	99	98½	100½
Central Ark. Ry. & Lt.	5s 1928	99	98½	100
Central Ga. Pwr.	5s 1938	95½	93	97
Central Ill. Lt.	5 1943	98½	94	99½
Central Ill. Publ Serv.	f 1952	89½	84½	92½
Central Ill. Pub. Serv.	5½s 1950	96	96½	98
Central Ill. Pub. Serv.	6s 1944	100	96½	101½
Central Ind. Pwr.	6s 1947	98	95½	99½
Central Pa. Pwr. & Lt.	6s 1944	99½	97	100½
Central N. Y. Gas & El.	5s 1941	96½	94	97½
Central Pwr. & Lt.	6s 1946	100½	97½	101½
Central Pwr. & Lt.	6½s 1952	101½	94	102½
Central States Elec.	5s 1926	l 99	98	102½
Chattanooga Ry. & Lt.	5s 1956	84	81	85
Cincinnati Gas & Elec.	5s 1956	102	98½	102½
Cincinnati Gas & Elec.	5½s 1967	103½	100½	105
Cities Service	6s 1966	91½	90	91½
Cities Service	7s B1966	180	150½	178½
Cities Service	7s C 1966	126½	111	128
Cities Service	7s D 1966	101½	98½	106½
Cities Service	7s E 1966	111½	111	112½
Cities Service Pwr. & Lt.	6s 1944	93½	93½	95
City Lt. & Trac., Sedalia, Mo.	5s 1952	84	74	85½
Cleveland Elec. Illum.	5s 1939	101½	100	102
Cleveland Elec. Illum.	5s 1954	100½	97½	101
Cleveland Elec. Illum.	7s 1941	110	109	111½
Colorado Pwr.	5s 1953	95	93	96½
Columbia Gas & Elec.	5s 1927	99½	99½	100½
Columbia Ry., Gas & El.	5s 1936	92	92½	94½
Columbus, Dela. & Marion Elec.	5s 1937	85	83	88
Columbus, Dela. & Marion Elec.	6s 1937	95	91	98
Columbus Elec. & Pwr.	6s 1947	j102	....	....
Columbus Ry., Pwr. & Lt.	5s 1940	95½	93½	98
Columbus Ry., Pwr. & Lt.	6s 1941	103	101½	105
Commonwealth Edison	5s 1943	a100½	99½	102½
Commonwealth Edison	5s 1953	99½	98½	101
Commonwealth Edison	5s 1954	99½	98	101
Commonwealth Pwr.	6s 1947	103½	97½	103½
Community Pwr. & Lt.	6s 1950	96	94½	98
Conn. Ry. & Lts.	4½s 1951	91	90½	92½
Consol. Cities, Lt., Pwr. & Trac.	5s 1962	80	75½	82½
Consol. Elec.	5s 1955	97	94	98½
Consol. Gas of N. Y.	5½s 1945	104	101½	105
Con. Gas, Elec. Lt. & Pwr. of Balti.	4½s 1935	97	95½	97½
Con. Gas, Elec. Lt. & Pwr. of Balti. (notes)	6s 1949	105½	104½	108
Con. Gas, Elec. Lt. & Pwr. of Balti.	5½s 1952	c 105	102½	105½
Con. Gas, Elec. Lt. & Pwr. of Balti.	5s 1965	c 99½	99	100½
Consumers Elec. Lt. & Pwr.	5s 1936	95	93	96½
Consumers Pwr.	5s 1936	100	99	100½
Consumers Pwr.	5s 1952	97½	90½	100
Consumers Pwr.	5½s 1954	103	99	104½
Continental Gas & Elec.	5s 1927	100	99½	100½
Continental Gas & Elec.	6s 1947	99½	98	101
Continental Gas & Elec.	6½s 1964	99	96½	101
Continental Gas & Elec.	7s 1954	104½	99	103½
Cumberland County Pwr. & Lt.	5s 1942	94½	92	96½
Dallas Pwr. & Lt.	6s 1949	104	103	105½
Dayton Ltg.	5s 1937	100	98½	100½
Dayton Pwr. & Lt.	5s 1941	99½	97	100½
Defiance Gas & Elec.	5s 1942	95	88½	97½
Denver Gas & Elec.	5s 1949	97½	97½	100
Denver Gas & Elec. Lt.	5s 195'	94½	92½	97
Des Moines Elec.	5s 193o	98	98	100½
Detroit Edison	5s 1933	100½	99½	102½
Detroit Edison	5s 1940	102½	99½	102½
Detroit Edison	5s 1949	100½	97½	101½
Detroit Edison	5s 1955	99½	99½	100½
Detroit Edison	6s 1932	139	110½	155
Detroit Edison	6s 1940	107½	106½	108½
Detroit Edison	7s 1928	138½	125	156½
Detroit Edison	7s 1929	135	114	150½
Detroit Edison	7s 1930	140	121½	158½
Dominion Pwr. & Trans.	5s 1932	96½	95½	98½
Driver-Harris	8s 1931	96	88	97
Dubuque Elec.	6s 1942	101½	97½	102
Duke-Price Pwr.	6s 1949	101½	98½	103
Duquesne Lt.	6s 1949	105½	104½	107½
Duquesne Lt.	5½s 1949	105½	104	106
Durham Pub. Serv.	7s 1949	100	97½	101½
East Penn. Elec.	6s 1953	104½	100½	105½
East Oregon Lt. & Pwr.	6s 1929	100	97½	100½
East. Tex. Elec.	5s 1942	j 95	....	....
Economy Lt. & Pwr.	5s 1956	98½	96	99½
Edison Elec. Illum. of Bkln.	4s 1939	92½	89	95½
Edison Elec. Illum. (N. Y.)	5s 1995	102½	99½	103
El Paso Elec.	5s 1932	j102	....	....
El Paso Elec.	5s 1950	j 95½	....	....
Elec. Pwr. Corp. (Germany)	6½s 1950	87½	86½	88½
Elmira Wtr., Lt. & R.R.	5s 1956	95	92½	96½
Empire Dist. Elec.	5s 1949	91	86½	91½
Erie Ltg.	5s 1967	98	95½	99½
Evansville Gas & Elec. Lt.	5s 1932	98½	96	100
Federal Lt. & Trac.	5s 1942	92	88	96½
Federal Lt. & Trac.	6s 1942	101½	96½	103
Federal Lt. & Trac.	6s 1954	92½	91½	94½
Ft. Smith Lt. & Trac.	5s 1936	79	76½	82½
Ft. Worth Pwr & Lt.	5s 1931	99½	99	100½
Galveston Elec.	5s 1940	91	86½	93½
General Elec.	3½s 1942	87	83	90½
Georgia Carolina Pwr.	5s 1952	86	82	90
Ga. Lt., Pwr. & Rys.	5s 1941	86	86½	90½
Ga. Ry. & Elec.	5s 1932	99	98½	100½
Ga. Ry. & Elec.	5s 1949	92½	88	94½
Ga. Ry. & Pwr.	5s 1954	94½	89½	96
Ga. Ry. & Pwr.	6s 1947	102½	100½	103½
Ga. Ry. & Pwr.	7s 1941	104½	105	107
German Gen Elec.	7s 1945	95½	92	96½
German Gen. Elec.	6½s 1940	94½	94½	94½
Great Cons. Elec. Pwr (Japan)	6½ f1950	86	85½	86½
Great Cons. Elec. Pwr. (Japan)	7s 1944	90½	87½	92
Great Falls Pwr.	5s 1940	103½	99½	103½
Great Northern Pwr.	5s 1935	98½	96	99
Great Western Pwr.	5s 1946	98½	95	99½
Great Western Pwr.	5½s 1955	98½	96	99½
Great Western Pwr.	6s 1949	101½	100	102½
Great Western Pwr.	6s 1952	101½	99½	102½
Hamburg Elec.	7s 1935	f 96	95½	96
Havana Elec. Ry., Lt. & Pwr.	5s 1954	92½	85½	95½
Holtwood Pwr.	6s 1954	103½	100	104½
Houston Ltg. & Pwr.	5s 1931	99½	98½	100
Houston Ltg. & Pwr.	5s 1953	94	90½	95½
Houston Ltg. & Pwr.	5½s 1954	101½	97	102½
Hydraulic Pwr.	5s 1951	101	99½	102
Hydraulic Pwr.	5s 1950	101	100	103
Idaho Pwr.	5s 1947	96½	93	97½
Ill. Elec. Pwr.	6s 1943	102½	99½	103½
Ill. Pwr.	5s 1933	93½	93	95½
Ill. Pwr. & Lt.	6s 1953	101½	100½	102½
Ill. Pwr. & Lt.	7s 1953	103	99	102½
Ind. Elec.	6s 1947	98	97	99½
Ind. Gen. Serv.	5s 1948	95½	92	97½
Ind. Lighting	4s 1958	80½	78	83½
Indiana & Mich. Elec.	5s 1957	98½	97½	99½
Indiana & Mich. Elec.	5s 1955	95½	95	98½
Ind. Pwr.	7½s 1941	l 105½	104	106

Stock Exchange: aChicago; bSt. Louis; cPhiladelphia; dBoston; eBaltimore; fMontreal; gCincinnati; hSan Francisco; iPittsburgh. jBid, low, high, Tuesday, Dec. 15. kBid, low, high, Wednesday, Dec. 16. lLatest quotations available.

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies			Bid Price Saturday, Dec. 12	Low 1925	High 1925
BONDS (Continued)					
Ind. Service	5s	1950	89½	86½	92
Ind. Service	6s	2020	85	73	88½
Ingersoll-Rand	5s	1935	99½	99½	99½
Int'l. Pwr. Sec	6½s	1928	97	97½	99½
Interstate Elec	6s	1933	95	95	99½
Interstate Pwr	6s	1944	97½	95	99½
Interstate Pwr	7s	1934	101	97	101
Interstate Pub. Serv	6s	1948	98	96	100½
Iowa Ry. & Lt	5s	1932	98	97	99½
Italian Power	6½s	1928	101½	97½	101½
Jersey Cent. Pwr. & Lt.	5½s	1945	95½	95	98
Kansas City Pwr. & Lt.	5s	1952	100	95½	102
Kansas Elec. Pwr	6s	1937	100½	97½	102
Kansas Elec. Pwr	6s	1943	100½	97½	102
Kansas Gas & Elec	6s	1952	102½	98½	103½
Kansas Gas & Elec	6s	2022	92	86½	94½
Kentucky Utilities	6s	1949	100½	97	101½
Kings County Elec. Lt. & Pwr	5s	1937	102	99	103
Kings County Elec. Lt. & Pwr	6s	1997	119½	114½	120½
Kings County Ltg	5s	1954	98½	89	101½
Kings County Ltg	6½s	1954	107½	103½	108½
Knoxville Ry. & Lt	5s	1946	93½	88	95½
Laclede Gas Lt	5s	1934	100½	98½	102½
Laclede Gas Lt	5½s	1953	102	95½	102½
Laurentian Pwr	6s	1936	100	96	100½
Laurentide Pwr	6s	1936	f99	96	100
Laurentide Pwr	5s	1946	99	97	100½
Laurentide Pwr	6s	1936	f99		
Lehigh Pwr. Sec. (notes)	6s	1927	100½	100½	101½
Lincoln Gas & Elec	5s	1941	91	92½	95½
Long Island Ltg	5s	1936	99½	98½	100½
Long Island Ltg	6s	1954	100½	99½	102
Long Island Ltg	6s	1948	104½	102	105½
Los Angeles Gas & Elec.	5s	1939	100	98	101½
Los Angeles Gas & Elec.	5½s	1943	98½	94	99½
Los Angeles Gas & Elec.	5½s	1947	98½	96	99½
Los Angeles Gas & Elec.	5½ s	1949	98½	95½	99½
Los Angeles Gas & Elec.	6 s	1942	102½	101½	104½
Louisiana Pwr	6s	1944	97½	97	99
Louisville Gas & Elec	5s	1952	97½	90½	99½
Louisville Gas & Elec	5½s	1954	102½	103	103
Lower Austrian Hydro Elec	6½s	1944	86½	85½	87
Luzerne County Gas & Elec	5s	1948	98	97	99½
Luzerne County Gas & Elec	7s	1944	104½	99½	104½
Luzerne County Gas & Elec	6s	1954	102½	99	105
Madison River Pwr	5s	1935	100½	99½	101
Manila Elec	7s	1942	102	97½	103
Manila Elec. Ry. & Ltg.	5s	1953	89	85	92
Manitoba Pwr	7s	1941	103½	98½	104½
Memphis Pwr. & Lt.	5s	1948	98½	95	99½
Metropolitan Edison	6s	1952	104½	101½	106½
Metropolitan Edison	5s	1953	96½	91½	97
Metropolitan Pwr	6s	1953	102½	100	104
Michigan Lt.	5s	1946	99	97½	100
Michican No. Pwr	5s	1941	97½	95½	98
Milwaukee Elec. Ry. & Lt	5s	1926	100	99½	101½
Milwaukee Elec. Ry. & Lt	4½s	1931	96½	94½	97½
Milwaukee Elec. Ry. & Lt	5s	1951	98½	94	100
Milwaukee Elec. Ry. & Lt	5s	1961	89½	84½	92½
Milwaukee Elec. Ry. & Lt	6s	1953	101	98½	104
Minn. Pwr & Lt	5s	1955	96	95	97
Minn. Pwr. & Lt	6s	1950	104	101½	105½
Miss. River Pwr	5s	1951	99	96½	100½
Miss. River Pwr	7s	1935	102	102	104
Mo. Edison Elec	5s	1927	ł 99½	99½	100½
Mobile Elec	5s	1946	96½	91	97½
Montana Pwr	5s	1943	100½	97½	100½
Montgomery Lt. & Wtr. Pwr	5s	1943	ł 93	86½	93½
Montreal Lt., Ht. & Pwr.	4½s	1932	97	97	98½
Montreal Lt., Ht. & Pwr.	5s	1933	98½	98½	101
Montreal Pub. Serv	5s	1942	94½	89	94½
Mountain States Pwr.	6s	1938	98½	96½	100½
Nashville Ry. & Lt.	5s	1953	97½	94	98
Nashville Ry. & Lt.	5s	1958	92	84	92
Nassau Lt. & Pwr	5s	1927	99½	98	101
Nassau & Suffolk Ltg	5s	1945	89	82	91
National Pwr. & Lt.	7s	1972	103	97	104½
National Pub. Serv	6½s	1955	94½	94	96½
Nebraska Pwr	5s	1949	99½	97	100½
Nebraska Pwr	6s	2022	95	89½	97½
Nevada-Calif. Elec	6s	1946	98½	96½	100½
Nevada-Calif. Elec	6s	1950	98½	96½	100½
New England Pwr	5s	1951	101½	100½	103
New Jersey Pwr. & Lt.	5s	1936	96½	92½	97½
New Orleans Pub. Serv.	4½s	1935	86½	83½	88½
New Orleans Pub. Serv.	5s	1952	91	89½	92
New Orleans Pub. Serv.	5s	1955	89½	88½	92½
New Orleans Pub. Serv.	6s	1949	89	86½	93½
N. Y. & Queens Elec. Lt. & Pwr	5s	1930	100	99½	101
N. Y. & Westchester Ltg	4s	2004	78	76	81
N. Y. & Westchester Ltg	5s	1954	96	93	97
New York Edison	6½s	1941	115	112	115½
New York Edison	5s	1944	101½	99½	102
N. Y. Gas & Elec. Lt., Ht. & Pwr	5s	1948	103½	100½	104½
N. Y. Gas & Elec. Lt., Ht. & Pwr	4s	1949	89	86	90½
N. Y. State Gas & Elec.	5½s	1962	100½	96	101½
Newport News & Hampton Ry., Gas & Elec	5s	1944	85	84	93
Niagara Falls Pwr	5s	1932	102	99½	103
Niagara Falls Pwr	6s	1932	103	103½	106½
Niagara Falls Pwr	6s	1950	105	105½	106½
Niagara, Lock. & Ont. Pwr	5s	1954	f 98½	104½	110
Niagara, Lock. & Ont. Pwr	5s	1955	98½	97½	100
Niagara, Lock. & Ont. Pwr	6s	1958	ł 109½	104½	110½
Norfolk Ry. & Lt.	5s	1949	94	93	95½
No. Amer. Edison	6s	1952	102	96½	103
No. Amer. Edison	6½s	1948	104½	100½	106
No. Amer. Lt. & Pwr.	7s	1954	99½	97	100½
North Caro. Pub. Serv.	5s	1934	90	89	93½
North Caro. Pub. Serv.	6s	1954	94	91½	96
North Caro Pub. Serv	6½s	1944	99	96	100
North Shore Elec	5s	1940	99½	97½	100
No. Calif. Pwr	5s	1948	99½	98½	100½
No. Ind. Gas & Elec	5s	1929	99	97	100½
No. Ind. Gas & Elec	6s	1952	102½	99½	103½
Northern N. Y. Utilities	5½s	1949	99	96½	100½
No. Ohio Trac. & Lt	4s	1933	87	82	87½
No. Ohio Trac. & Lt	5s	1956	82	78	87
No. Ohio Trac. & Lt.	6s	1926	99	98½	100
No. Ohio Trac. & Lt.	6s	1947	94½	91	97
No. Ontario Lt. & Pwr.	6s	1931	98½	95½	99½
No. States Pwr.	6½s	1933	134	105½	141
No. States Pwr. (notes)	6½s	1933	103½	99½	104½
No. States Pwr	6s	1948	102½	101	104½
No. States Pwr	6s	1941	104½	103	107½
No. States Pwr	5s	1941	97½	93	99½
No. Tex. Elec	5s	1940	73	74	82½
Northwestern Elec	6s	1935	101½	101½	102½
Northwestern Pub. Serv.	6½s	1948	99	97½	100½
Ohio Pwr	5s	1952	93½	89½	96
Ohio Pwr	6s	1953	103	101	104½
Ohio Pwr	6s	2024	95	88½	95½
Ohio Pwr	7s	1951	105½	105½	107½
Ohio Pub. Serv	5s	1954	91½	87	93
Ohio Pub. Serv	6s	1953	100½	99	101½
Ohio Pub. Serv	7½s	1946	112½	108	112½
Ohio Pub. Serv	7s	1947	110½	107½	111½
Ohio River Edison	6s	1948	101	98½	104
Okla. Gas & Elec	5s	1950	92½	91½	95
Okla. Gas & Elec	6s	1940	96½	95½	98½
Ontario Pwr. of Niagara Falls	5s	1943	99½	98	100½
Ontario Transmission	5s	1945	99½	97	99½
Ozark Pwr. & Wtr.	5s	1952	76	75	79
Pacific Coast Pwr	5s	1940	99	98	100
Pacific Gas & Elec	5s	1942	98	93½	99
Pacific Gas & Elec	5s	1955	ł 93½	94	95½
Pacific Gas & Elec	5½s	1952	101½	99½	102½
Pacific Gas & Elec	6s	1941	106	103½	106½
Pacific Lt. & Pwr	5s	1951	99½	98½	100½
Pacific Lt. & Pwr	5s	1942	99	98	101½
Pacific Pwr. & Lt	5s	1930	99½	98	100
Pacific Pwr. & Lt	5s	1953	ł 96½		
Parr Shoals Pwr	5s	1952	93	92½	97
Paterson & Passaic Gas & Elec	5s	1949	100	96	100½
Penn Central Lt. & Pwr	6s	1953	103½	102	104½
Penn Edison	5s	1946	96½	93½	97½
Penn Elec	6½s	1954	98½	96½	99½
Penn. Elec	6s	1955	93½	91½	95
Penn.-Ohio Edison	6s	1950	98½	97½	98½
Penn Ohio Elec	6½s	1938	105½	99½	105½
Penn Ohio Pwr. & Lt.	5½s	1954	97½	95½	99½
Penn Ohio Pwr. & Lt.	6s	1939	97½	94½	99½
Penn Pwr. & Lt	5s	1952	97½	95½	98½
Penn Pwr. & Lt	5s	1953	97½	95½	98½
Penn Pwr. & Lt	6s	1953	104½	102½	105½
Penn Pwr. & Lt	7s	1951	105½	105½	107½
Penn Pub. Serv	5s	1954	95½	93½	96½
Penn Pub. Serv	6s	1947	104½	103½	105½
Penn Wtr. & Pwr	5s	1940	101½	99½	102½
Penn Wtr. & Pwr	5½s	1953	102½	100½	103½
Phila. Co	6s	1944	103½	101½	105
Phila. Co	5½s	1938	99½	93½	100
Phila. Co	5s	1951	96	93½	97
Phila. Co	5s	1949	c 103½	93½	104
Phila. Elec	6s	1941	c 108	106	108½
Phila. Elec	5s	1966	c 102½	100	104½
Phila Elec	4s	1966	ł 85	83	85
Phila. Elec	5s	1960	c 100½	100	104
Phila. Elec	5½s	1947	c 106½	103½	107
Phila. Elec	5½s	1953	c 106½	104½	107½
Portland Elec. Pwr	6s	1947	99	96½	100½
Portland Gen. Elec	5s	1935	99½	98½	100½
Portland Ry., Lt. & Pwr.	5s	1942	89	84½	92
Portland Ry., Lt. & Pwr.	6s	1947	99	94	100½
Portland Ry., Lt. & Pwr.	7½s	1946	106½	104½	108
Potomac Edison	6s	1949	98½	96	100
Potomac Edison	6½s	1948	102½	99	103½
Potomac Elec. Pwr	5s	1929	99½	99	100½
Potomac Elec. Pwr	5s	1936	99½	98½	100
Power Corp. of N. Y.	6s	1942	100½	97	101½
Power Corp. of N. Y.	6½s	1942	104½	101½	105½
Power Securities	6s	1949	f 79		
Pub. Lt. & Pwr	5s	1945	69	64	79
Pub. Serv. Co. of Colo.	5½s	1954	93½	92	96
Pub. Serv. Co. of Colo.	6s	1953	98½	98	101
Pub. Serv. Co. of Colo.	7s	1933	101	98½	102½
Pub. Serv. Corp. of N. J.	5s	1959	104½	103½	105½
Pub. Serv. Corp. of N. J.	6s	1944	100½	95	101
Pub. Serv. Co. of No. Ill.	5s	1956	96½	91	97½
Pub. Serv. Co. of No. Ill.	5½s	1962	101½	96½	102½
Pub. Serv. Co. of No. Ill.	5½s	1964	101½	96½	102½
Pub. Serv. Co. of Okla.	6s	1949	99	97½	101
Pub. Serv. Elec. & Gas.	5½s	1959	103½	98½	105½
Pub. Serv. Elec. & Gas.	5½s	1964	103½	99½	105
Public Utilities, Evansville, Ind.)	6s	1929	100	99	101
Puget Sound Pwr	5s	1933	98½	98½	100½
Puget Sound Pwr. & Lt.	5½s	1949	99½	96½	100½
Quebec Pwr	6s	1953	102	98½	102½
Queensborough Gas & Elec	5s	1952	99	96½	100½
Queensborough Gas & Elec	6s	1953	104½	101	105½
Rhine-Westphalia Electric Power	7s	1950	94½	94	95
Rio de Janeiro Tram., Lt. & Pwr	5s	1935	93	85	93½
Robbins & Myers	7s	1952	60	57½	73
Rochester Gas & Elec	5½s	1948	105½	102½	105½
Rochester Gas & Elec	7s	1946	112½	110	112½
Rochester Ry. & Lt.	5s	1954	100	99	101
Rockford Elec	5s	1939	99½	98	101
St. Joseph Ry., Lt., Ht. & Pwr	5s	1937	91	85½	93
St. Paul Gas Lt	5s	1944	100	98½	101
St. Paul Gas Lt	5½s	1954	101½	98	102½
Salt River Valley Wtr.	6s	1938	j 100		
Salmon River Pwr	5s	1952	101½	98½	101½
San Antonio Gas & Elec.	5s	1949	97	96	98½
San Antonio Pub. Serv.	6s	1952	101½	99½	104
San Diego Cons. Gas & Elec	5s	1939	100	98	101
San Diego Cons. Gas & Elec	6s	1939	101½	99	103
San Joaquin Lt. & Pwr.	5s	1945	98½	98	100
San Joaquin Lt. & Pwr.	6s	1950	102	101	103½
San Joaquin Lt. & Pwr.	6s	1952	101	99½	103½
San Joaquin Lt. & Pwr.	6s	1954	100½	99	101
Sauda Falls	5s	1955	98	98	98½
Savannah Elec. & Pwr.	7½s	1941	104½	....	....
Saxon Pub. Wks. (Germany)	7s	1945	93	90½	94
Scranton Electric	5s	1937	101½	99½	101½
Seattle Elec	5s	1930	99½	99½	101
Seattle Elec	5s	1929	99½	99	100½
Seattle Elec	5s	1939	92	90	93½
Seattle Ltg	5s	1949	92	85½	93
Shawinigan Wtr. & Pwr.	5s	1934	100	100	101½
Shawinigan Wtr. & Pwr.	5½s	1950	103½	101½	104
Shawinigan Wtr. & Pwr.	6s	1950	105	104	106½
Siemens & Halske	7s	1928	96½	92½	99½
Siemens & Halske	7s	1935	94½	90½	96½
Sierra & San Francisco Pwr	5s	1949	77	75	80
Sierra & San Francisco Pwr	6s	1949	90	87	93½
Sioux City Gas & Elec	6s	1947	101½	99	102
Sioux City Gas & Elec	6s	1949	101½	99	102
So. Caro. Gas & Elec	6s	1942	84	87	93
So. Caro. Gas & Elec	6s	1932	75	78	88
Southeast Pwr. & Lt.	6s	2025	90½	88	91½
So. Cal. Edison	5s	1939	99½	99½	101
So. Cal. Edison	5s	1944	95½	92½	96½
So. Cal. Edison	5½s	1944	101	98½	102
So. Cal. Edison	6s	1943	102	100½	104
So. Cal. Edison	6s	1944	104½	102½	105½
So. Cities Utilities	8s	1931	98	99	102
Southern Colo. Power	6s	1947	98	93½	99½
So. Public Utilities	5s	1943	99½	97½	100
So. Sierras Pwr	6s	1936	102½	102	104½
So. Utilities	6s	1933	102	97½	102½
So. Wisconsin Pwr	5s	1938	90½	88	93
Southwestern Gas & Elec	5s	1932	96½	94	98
Southwestern Gas & Elec	6s	1957	97	89	98
Southwestern Lt. & Pwr.	6s	1937	97½	94½	97½
Southwestern Pwr. & Lt.	5s	1943	94	90	97
Southwestern Pwr. & Lt.	6s	2022	92	88½	94½
Southwestern Utilities	8s	1936	96	96	102
Springfield Ry. & Lt	5s	1926	99½	98½	100½
Standard Elec. of Cal	5s	1939	98½	98½	100½
Standard Gas & Elec	6s	1935	99½	91	101
Staten Island Edison	6½s	1953	105	104	106½
Syracuse Ltg	5s	1951	100½	97½	101½
Syracuse Ltg	5½s	1954	102	100½	103
Tampa Elec	5s	1933	f99	....	....
Tenn. Elec. Pwr	6s	1947	102½	99½	104½
Tenn. Pwr	5s	1962	94½	90	96½
Tex. Pwr. & Lt.	5s	1937	98	97	99½
Tex. Pwr. & Lt.	6s	2022	95½	90	97
Tide Water Pwr	6s	1942	99½	98½	101
Tide Water Pwr	7s	1937	99½	97½	101½
Toho Elec. Pwr. (Japan)	7s	1955	90½	87	91½
Tokyo Elec. (Japan)	6s	1928	97½	97½	99½
Toledo Edison	5s	1947	98½	97	100
Toledo Edison	7s	1941	109	108½	110
Toledo Gas Elec & Htg	5s	1935	96½	97½	100½
Toledo Trac., Lt. & Pr. notes	5½s	1930	98	97½	100½
Topeka Edison	5s	1930	98½	97	100
Topeka Ry. & Lt.	5s	1933	95	90½	96½
Trenton Gas & Elec	5s	1949	99½	98	100
Tri-City Ry. & Lt.	5s	1930	98½	96½	99½
Twin State Gas & Elec.	5s	1953	92½	84	94½
Tyrol Hydro-Elec. Pwr.	7½s	1955	96½	94½	97
Union Elec. Lt. & Pwr.	5s	1932	101½	99½	102
Union Elec. Lt. & Pwr.	5s	1933	100½	98½	101
Union Elec. Lt. & Pwr.	5s	1954	99½	97½	100
Union Elec. Lt. & Pwr.	5½s	1954	100½	100½	104
United Elec. of N. J.	4s	1949	87½	85	88½
United Elec. Lt. & Pwr.	4½s	1929	f 98½	98½	99
United Gas & Elec	6s	1945	98	96	101
United Lt. & Pwr. notes	5½s	1928	99½	98	100
United Lt. & Pwr.	5½s	1959	94½	90½	97½
United Lt. & Pwr.	6½s	1974	96	92½	97½
United Lt. & Rys.	5s	1932	96	92½	97½
United Lt. & Rys.	6s	1926	99½	100½	102½
United Lt. & Rys.	6s	1952	98½	95½	100½
United Lt. & Rys.	6s	1973	90	87	92
United Pwr. & Lt.	6s	1944	101½	99	103
Utah Lt. & Trac	5s	1944	87½	83½	91½
Utah Pwr. & Lt.	5s	1944	95½	91	98½
Utah Pwr. & Lt.	6s	1944	102½	102	104½
Utah Pwr. & Lt.	6s	2022	93	88½	94½
Utica Elec. Lt. & Pwr.	5s	1950	102½	100½	102½
Utica Gas & Elec	5s	1957	100½	98½	103
Vermont Hydro-Elec	6s	1929	100	98½	100½
Vicksburg Lt. & Trac	5s	1932	91	89	93½
Virginian Pwr	5s	1942	92½	88	96
Virginian Pwr	6½s	1954	102	99	103
Virginia Ry. & Pwr.	5s	1943	98	93½	99
Wagner Elec. Mfg	7s	....	f 101½	100	102
Washington Coast Util.	6s	1941	101½	99½	102
Washington Wtr. Pwr.	5s	1939	101½	99½	101½
West Penn Pwr	5s	1963	100	93½	100
West Penn Pwr	5s	1946	99½	93½	100½
West Penn Pwr	5½s	1953	104½	100½	105½
West Penn Pwr	7s	1946	106	104½	107½
West Virginia Lt., Ht. & Pwr	6s	1929	100	95	101
West Virginia Utilities	6s	1935	94	91	98
Westchester Ltg	5s	1950	101½	98	102
Western Elec	5s	1944	100½	98	101½
Western N. Y. Utilities	5s	1946	96½	90½	97½
Western Pwr	6½s	1954	100½	97	101
West. States Gas & Elec.	5s	1941	97½	95	99½
West. States Gas & Elec.	6s	1947	99	97	100½
Westinghouse Elec. & Mfg	7s	1931	106	105½	108½
Westphalia Un. Elec. Pr.	6½s	1950	ł 87½	87½	87½
Wisconsin Elec. Pwr.	5s	1954	98½	93½	99½
Wisconsin Gas & Elec	5s	1952	99	97	100
Wis.-Minn. Lt. & Pwr.	5s	1944	95½	93	96½
Wis. Ry., Lt. & Pwr.	5s	1933	92½	87½	93½
Wis. River Pwr	5s	1941	90½	88	92½
Yadkin River Pwr	5s	1941	98½	96½	99½
Yarmouth Lt. & Pwr.	5s	1937	83	82	87
Yarmouth Lt. & Pwr.	8s	1951	98	97	102

Stock Exchange: aChicago; bSt. Louis; cPhiladelphia; dBoston; eBaltimore; fMontreal; gCincinnati; hSan Francisco; iPittsburgh. jBid, low, high, Tuesday, Dec. 15. kBid, low, high, Wednesday, Dec. 16. lLatest quotations available.

Business Facts for Electrical Men

Selected Statistics Presented Graphically for the Use of All Interested in Analyzing the Trend of the Electrical Business

The Activities of the Central-Station Industry in New England

ONE of the most pleasant sensations of life is to encounter optimism and progress in a situation which is essentially gloomy and unprogressive. Such a condition is presented when a study is made of the activities of the electric light and power companies in New England during the past six years.

The six states which comprise New England are experiencing an industrial slump which has called for extreme measures on the part of these commonwealths. Last month 625 delegates, representing 288 business and public utility organizations, met to discuss the vital problems of New England power supply, agriculture and marketing. At the same meeting great faith was expressed in the future of the Northeast by the executives of the public utility companies operating in the section.

That this faith is justified is indicated from a study of the accompanying chart, showing the output of the electric light and power companies of New England since 1920, compared with the estimated normal production based upon the activities of the past five years.

During the year 1925 the operations of these companies have been materially above the trend established during the past five years, this abnormal activity ranging from 6.3 per cent in January to 4.7 per cent in October. That is, the energy sales of the central-station companies operating in New England have increased at a faster rate during 1925 than during the five previous years taken as a whole. There is every reason to believe that by the opening of the new year the energy sales will be 7 or 8 per cent above the five-year trend.

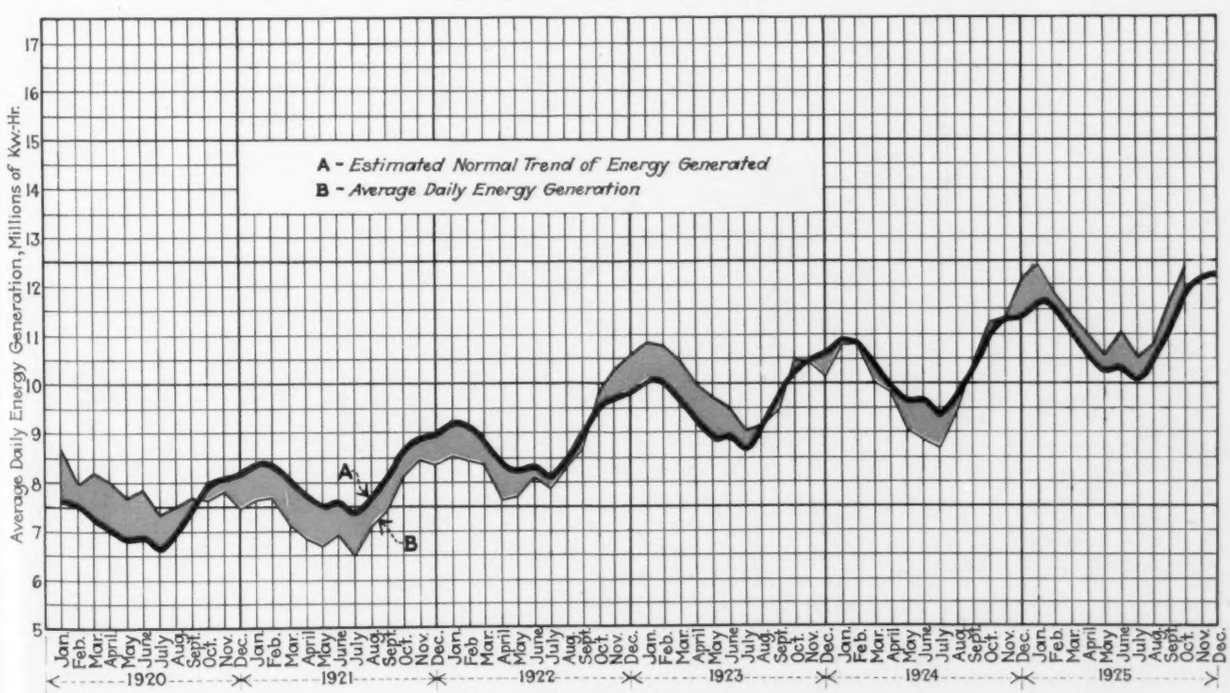
Some idea of the progress made by the central-station industry in the New England States is to be drawn from the fact that the energy generated has increased from 2,848,703,000 kw.-hr. in 1920 to an estimated 4,158,000,000 kw.-hr. in 1925, the value of plant and equipment from $306,000,000 to $512,000,000, gross revenue from $84,570,000 to $143,000,000, customers served from 875,000 to 1,636,000, number of employees from 11,400 to 15,200, rating of installed generators from 1,567,000 kva. to 2,143,000 kva., water-power development from 1,300,000 hp. to 1,399,000 hp., and that during this six-year period the industry has spent a total of $175,000,000 for additions and extensions to the transmission and distribution equipment.

The trends established in the present year point to a large growth in central-station operations in New England in 1926.

Most of the data for statistics in the ELECTRICAL WORLD are gathered by it from original sources. Privilege is freely given to readers of the ELECTRICAL WORLD to quote for use these statistics for any legitimate purpose. While there is no requirement that the source of data be given, yet it would help the ELECTRICAL WORLD in obtaining and compiling further basic information if those who make use of these statistics would give credit to the ELECTRICAL WORLD.

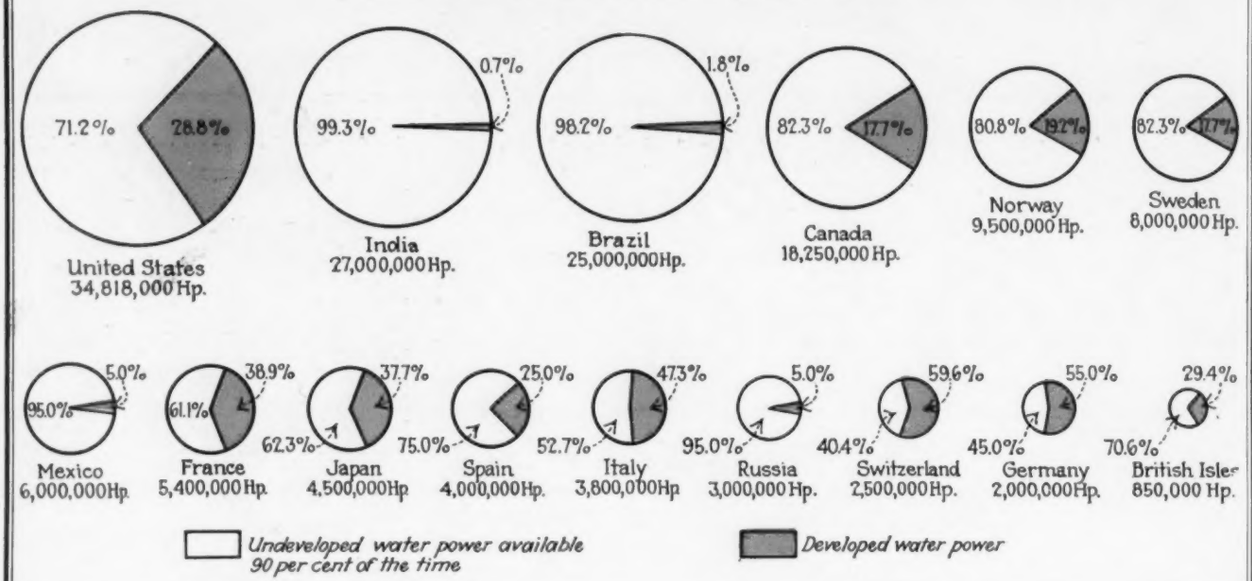
Energy Generated by Central Stations in the New England States

(100 per Cent of the Industry)



Potential and Developed Water Power in the Leading Countries of the World

(Data Issued by the United States Geological Survey)



Energy Resources Reflect National Strength

MANY thousands of years ago men reached a stage in their evolutionary development when they grouped themselves into national units. Since that time every nation has striven to increase its national wealth and strength by conquest, purchase and treaty. In the past centuries national wealth and strength have been measured by man power, control of trade routes both on land and on the seas, and the possession of precious metals mined and unmined. Nation after nation has been drenched in blood, not once but scores of times, that this national prestige might be maintained or increased.

The past hundred years, however, have opened up a new era in national development. True, nations have continued to use every means in their power to advance their strength through conquest, purchase and treaty, but as industry has developed and muscle power has given way to machine power, the basis for determining a nation's wealth and strength has materially changed. Today the real basis of the power of a nation lies in its natural energy resources rather than in its man-power strength, in its possession of raw products rather than in its control of trade routes. International agreement has opened the seas to the common use of all nations, and man power has become a symbol solely of national protection.

But the mere possession of large coal and petroleum fields and of extensive potential water powers does not necessarily spell national strength of large proportions. These must be backed up by an equable climate, national unity, an intelligent populace and the availability of raw products. These factors in combination must inevitably result in great national strength and wealth.

The United States possesses the best strength-giving combination of basic factors of all the nations of the world. Its coal resources are estimated at five hundred billion horsepower-years, its petroleum resources at four hundred million horsepower-years and its water powers at thirty-five million horsepower-years. In addition, it has a temperate climate, an unrivaled national unity, an intelligent citizenry and raw products of almost unending extent and variety. Canada also occupies an enviable place, both in the possession of large natural energy resources and in supporting elements of a high type.

Many countries, however, possess large natural energy resources, but a portion if not all the supporting elements are extremely weak. China, for instance, possesses coal resources estimated at two hundred billion horsepower-years, petroleum resources of sixty million horsepower-years and water powers of twenty million horsepower-years. But in the supporting elements China falls far short. Again, there are nations, such as Italy, with excellent supporting factors but possessing only one of the sources of natural energy. If Italy had large coal and petroleum fields in addition to her water powers, her place in the family of nations would be materially enhanced.

The future holds the greatest possibilities to the nation possessing large natural resources and favorable climatic and general economic conditions. But world conditions and international co-operation are becoming such that the countries poor in natural resources may draw strength from those nations blessed with large energy potentialities. In fact, it is to the material advantage of the nationally strong to lift the weak to a position of competence and at least nominal prosperity.